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TABLE OF CONTENTS.

PAGE
t of Plates xi
cers of the Institute, 1897-8 xii
gresses held by the Institute xiii

PAPERS READ.

Purification of Sewage by Bacteria, by Samuel Rideal, D.SC., F.I.C. . 59
Sanitary Supervision of Shelters for the Homeless, by F. J. Waldo, M.A., M.D., D.P.H. 83
ian Sanitation, by Baldwin Latham, M.INST.C.E. 93
ification of Measles, by Henry Kenwood, M.B., D.P.H., F.C.S. . . . 161

LECTURE TO SANITARY OFFICERS.

cation; Status, and Emoluments of Sanitary Inspectors, by A. Wynter Blyth 189

ual Report of the Council for the Year 1896 115

CONGRESS AT NEWCASTLE-UPON-TYNE.

Papers and Abstracts of Papers read at the Conferences.

MEDICAL OFFICERS OF HEALTH—

Control of Milk Supplies by Sanitary Authorities, by T. Coke Squance, M.D., M.S. 1
ation Hospitals for Rural Districts, by Roger McNeill, M.D., D.P.H. . 7
Control and Supervision of Public Water Supplies by Sanitary Authorities, by Charles Porter, M.D., D.P.H. 10
Account of an Outbreak of Rabies in the County Borough of Croydon, &c., by Leonard Wilde, M.D., M.R.C.P., D.P.H. 12
e Duties which will devolve upon Municipalities in connection with the Public and the Submerged Tenth, by R. Sydney Marsden, M.B., D.SC., D.P.H. 16
le-time Service of Medical Officers *versus* Part-time Service, by F. J. Waldo, M.D., and David Walsh, M.D. 19
Coal-miners exempt from Cancer? by Thomas Oliver, M.A., M.D., F.R.C.S. 20
Difficulties and Duties of the Medical Officer of Health under the Notification of Infectious Diseases Act. by Wm. Berry, F.R.C.S.I. . 24

MUNICIPAL AND COUNTY ENGINEERS—

PAGE
Jointing of Sewer and Drain Pipes, by R. S. Rounthwaite, ASSOC.M.INST.C.E. 22
Treatment of Crude Night-soil with Acidulated Ashes, by Herbert Jones, D.P.H. 25
Sewerage and Sewage Disposal of Colliery Villages, by J. E. Parker, ASSOC.M.INST.C.E. 29

SANITARY INSPECTORS—

Sanitary Work in Rural Districts, by W. Bland 31
The Spread of Scarlet Fever, by Tom Stake 32
The Position of Sanitary Authorities in relation to Factories, Workshops, and Shops, by Thos. Foley Case 33
Our Meat and Milk Supply, and the Law relating thereto, by G. T. Billing 39

PORT SANITARY AUTHORITIES—

Sanitation on Board Ship, by W. Collingridge, M.A., M.D. 40
Structural Sanitary Arrangements of Ocean Steamers and War Ships, by E. W. de Rusett, M.INST.C.E. 42

DOMESTIC HYGIENE—

Aspects of Cycling for Ladies, by E. B. Turner, F.R.C.S. 50
Hygiene in Relation to the Physical Development of Women, by Miss G. [illegible] 50
Swedish Gymnastics in England, by Miss Raeburn 52
The Value of Teaching Hygiene and Sick Nursing to Working Women, by Miss J. S. Davis 52
Some points of consideration in the Hygiene of Children, by Mrs. Mather 53
Our Houses, by Councillor Manson, L.R.C.P., M.R.C.S. 54
The Disposal of Household Refuse and the Improper Use of Ashpits, by Miss de [illegible] 54
Teaching of Hygiene in Schools of the Upper Middle Class, by Mrs. White Wallis 55
The Teaching of Housewifery in Elementary Schools, by Miss Dupré . 55

Resolutions passed at the Congress 57

CONGRESS AT LEEDS.

Inaugural Address, By Robert Farquharson, M.D.EDIN., LL.D., F.R.C.P., M.P., D.L., J.P. 257
Address to Section I., Sanitary Science and Preventive Medicine, by T. Pridgin Teale, M.A., M.B., F.R.C.S., F.R.S. 277
Address to Section II., Engineering and Architecture, by Lewis Angell, M.INST.C.E., F.R.I.B.A. 280
Address to Section III., Chemistry, Meteorology, and Geology, by Wm. Whitaker, B.A., F.R.S., F.G.S. 304

PAGE
Address to Conference on River Pollution, by Major Lamorock Flower, F.R.MET.SOC. . . . 317
Address to Conference of Municipal Representatives, by Mr. Councillor Womersley . . . 327
Address to Conference of Medical Officers of Health, by E. C. Seaton, M.D., F.R.C.P., F.C.S. . . . 335
Address to Conference of Municipal and County Engineers, by Thomas Hewson, M.INST.C.E . . . 345
Address to Conference of Sanitary Inspectors, by Peter Fyfe, F.R.S.(EDIN.) 347
Address to Conference of Ladies on Domestic Hygiene, by Mrs. Fawkes. 357
Lecture to the Congress, by H. Percy Boulnois, M.INST.C.E. . . . 358
Popular Lecture, by Philip Boobbyer, M.B. . . . 389

SECTION I.—SANITARY SCIENCE AND PREVENTIVE MEDICINE.

Disinfection, by J. Spottiswoode Cameron, M.D. . . . 397
Disinfection, by Professor S. Delepine, M.B., C.M. . . . 402
Disinfection of Rooms by Formic Aldehyde Vapours, by Henry Kenwood, M.B., D.P.H. . . . 406
Notes on the Examination of Disinfectants, by Wolf Defries, B.A. . . 416
The Behaviour of Diphtheria Bacillus outside the Human Body, and the Prevention of the Disease, by Prof. E. F. Trevelyan, B.SC., M.D. . 430
Some Sanitary Aspects of Advertisements, by R. Sydney Marsden, M.B., D.SC., F.R.S.EDIN. . . . 434
Report of the Royal Commission on Vaccination, by F. T. Bond, B.A., M.D., F.R.S.EDIN. . . . 438
Operation of the Housing of the Working Classes Act in Leeds, by G. F. Carter, ASSOC.M.INST.C.E. . . . 465
Hygiene in Elementary Education, by J. R. Kaye, M.B., D.P.H. . . 482
School Hygiene, by Arthur Kent . . . 488

SECTION II.—ENGINEERING AND ARCHITECTURE.

Fever Hospital Construction, by E. T. Hall, F.R.I.B.A. . . . 491
Temporary Dwellings for Public Works, by R. W. Newman, ASSOC.M.INST.C.E. . . . 514
Disposal of Refuse in a Mining Village, by Arnold Lupton, M.INST.C.E. . 515
Treatment of Domestic Slop Water in Isolated Houses, by G. V. Poore, M.D., F.R.C.P. . . . 519
The True Principles of Sewage Purification, by W. Kaye Parry, M.A. . 531
Scientific Basis of Sewage Treatment, by W. Dibdin, F.I.C., F.C.S., and G. Thudichum, F.C.S. . . . 541
Purification of Sewage, by S. Barwise, M.D., D.P.H. . . . 545
Purification of Sewage by Filtration through Coal, by Prof. A. Bostock Hill, M.D., D.P.H. . . . 554
A year's Experiment of the Septic Tank System of Sewage Disposal at Exeter, by Donald Cameron . . . 562
Storm Water in Relation to Sewage Purification, by E. J. Silcock, ASSOC.M.INST.C.E. . . . 570

SECTION III.—CHEMISTRY, METEOROLOGY, AND GEOLOGY.

PAGE
The Rocks of Yorkshire as a source of Water Supply, by P. F. Kendall, F.G.S. 591
A Decade of Sunshine Observations at Leeds, by H. Crowther and R. Reynolds 601
Air Pollution in Towns, by J. B. Cohen, PH.D. 607
Water Supplies from Wells, by J. Mitchell Wilson, M.D., D.P.H. . . . 611
Water Supplies for Rural Districts, and the means of Protecting them from Contamination, by J. C. Thresh, D.SC., M.D., D.P.H. 613
The Action of Moorland Water on Lead, and the Prevention of the same, by C. H. Tattersall, L.R.C.P., M.R.C.S. 625

Congress and Exhibition Notes 366
Awards made by the Judges 369

REVIEWS OF BOOKS.

Wasted Records of Disease (Charles E. Paget), by H. R. K. 110
The Theory and Practice of Hygiene (Notter and Firth), by L. C. P. . 200
The Dwelling House (G. V. Poore), by H. R. K. 634
Compressed Air Illness, or the so-called Caisson Disease (E. H. Snell), by C. T. W. 635

Notes on Books and Papers in Transactions 111, 201, 373, 638

Meetings held 134, 202, 375, 640
Address to the Queen 216
Commemorative Dinner of the 21st Anniversary of the Institute . . 218
Forthcoming Meetings of the Institute 140, 230, 378, 650
Fellows, Members, and Associates Elected . . . 142, 246, 380, 653

OBITUARY.

Sir Spencer Wells, BART. 146
Surgeon-General W. R. Cornish, C.I.E., Q.H.P., F.R.C.S. 656
Sir Henry Doulton 661

Programme of the Congress and Exhibition held at Leeds 232
Exhibits added to the Museum 147, 249, 663
Contributions and Additions to Library 148, 250, 383, 664
Notes on Legislation and Law Cases 153, 386, 670
General Notes 158, 255, 388, 671

LIST OF PLATES.

PAGE

Septic Tank Filtration—

Sketch Plan of the Septic Tank Plant at Belleisle for dealing with Sewage of St. Leonard, Exeter 64
Cycle for Four Filters 64
Section showing arrangement of Filtering Material 64
Nitrate Curves of Filters 64
Map showing the various centres to which the work of The Sanitary Institute has been extended 116
Table and Diagram showing the number of Candidates Examined and Certified each year 121
Diagram showing the Yearly Increase in the Roll of the Institute . . 129
Housing of the Working Classes Act, Leeds Improvement Scheme, map of 468
Garden arrangements for disguising waste-pipes 524
Filtration Gutters 526
Slop Filter 528
Generalised Section of the Rocks of Yorkshire, showing the respective maximum Thicknesses of the several sub-divisions 596
Diagram of Sunshine Observations at Leeds 605
The Weber Parkes Medal 672

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(Continued.)

CONFERENCE OF MEDICAL OFFICERS OF HEALTH.

E proceedings of the Conference commenced with an address the President, **Alfred Hill**, M.D., F.R.S.E., F.I.C., on me Remarks on Diphtheria," published in the Journal, Vol. II., Part III.

"*The Control of Milk Supplies by Sanitary Authorities,*" *by* T. Coke Squance, M.D., M.S., L.S.Sc., F.C.S.

(Member.)

the present day, with the enormous strides that have been e in sanitary progress and the consequent enlightenment of public, it would at first sight appear that the control of a supply of such importance to the community as milk would rally be vested in sanitary authorities; but this is far from g the case, and before it can become an accomplished fact apathy of the majority of sanitary authorities will have overcome.

is true that something has been done under the Milkshops Dairies Order to ensure better provision for the welfare he herd, greater cleanliness in the byres and dairies, and attention to the scouring of the milk cans, &c., but in of this in many places the bye-laws are practically not enforced, and the slovenly methods of dirty dairymen are far too much the rule instead of being the exception.

Theoretically we acknowledge that milk is a most potent factor in the conveyance of disease, while practically we do little or nothing to obviate this danger. An experience of many years and a large acquaintance with some of the dairy farms in the county of Durham have convinced the writer that until the milk supply is under the direct control of sanitary authorities the principal dangers which attach to it will continue to exist. There is no more conservative individual than the British farmer, who is, as a rule, quite content to conduct his business as his father did before him, believing in the health-giving odour of the muck heap adjoining the byre, and resisting ventilation because it decreases the yield of milk.

On such a farm the byres are generally small and over crowded, inadequately ventilated, pavement broken and uneven, stalls and feeding troughs dirty. A byre like this may be described,—of course with every apology to the shade of Tennyson:

I turn about, and in and out,
  The smell is not alluring;
With here and there, some dung about,
  And here and there, some urine.

Immediately before milking time the soiled straw and dung are removed and fresh litter put down, so that the air becomes laden with particles of dry dung and other refuse; at least, one of the milkers has just been engaged in removing the manure, and his hands are not washed before he commences his lacteal duties, upon teats frequently covered with excrement.

The milk pails after exposure to the contaminated air are emptied into barrels or milk cans, of course without the milk being previously cooled or strained, the bungs of which are then tightened with a piece of rag not always of the most cleanly description, after which the cans are delivered at their destination, the milk boy facilitating the emptying by removing the bung cloth, his fingers still remaining coated with what Carlyle describes as matter in the wrong place. There are, however, still graver evils when we consider that these overcrowded byres often contain two or three animals affected with tuberculosis, such animals often being the best milkers amongst "The milky mothers of the herd."

This milk is generally reserved for delicate children who have been ordered "milk from one cow;" if there is no special requirement in this direction, the milk yielded is mixed with that drawn from the others and distributed to the consumers.

The water supply is generally from the village pond to which e cattle have access, which is not unfrequently polluted with wage, and used by dogs as a bathing place and public con- nience.

Fortunately there are exceptions to this state of things, and ery care is taken on many dairy farms to ensure a supply of re milk. To remedy these evils it is very desirable that itary authorities should have the control of milk supplies, t under existing circumstances much could be done if the -laws under the "Milk Shops and Dairies Order" were ictly enforced, and if they were increased in stringency a at improvement in cleanliness would result.

Jnfortunately it often happens in rural districts that these -laws are to a very great extent inoperative as there is no tematic inspection of the farms, and as farmers are generally l represented on the District Council, they are, unless men acknowledge the present evils, naturally averse to any s being taken which would interfere with them. As far as own experience goes there is no more obstructive individual sanitary reforms being carried out upon farms than the trict Councillor who is a farmer, and in no particular is this e marked than in that of drinking water supply, when after wing attention again and again to the dangers attaching to a ted source, one is met by the practical farmer stating that s prefer such water, and that he has never known harm lt; of course the views of the practical man prevail over e of the Medical Officer of Health, who is not unfrequently rded as a visionary.

gain, the majority of the public, while interested in the ques- of a pure and wholesome supply of water for household oses, are content to acquiesce in the present condition of collection and distribution of milk, quite oblivious of the that Nature never intended milk to be delivered into pails, to be a direct supply from the teat into the mouth of the depending upon that source of nourishment; and who, tless, when arrived at bovine years of discretion will ively murmur—

"Who lulled me when I could not rest?
My Mother.
Who fed me from her gentle breast?
My Mother."

it was generally recognised that the present condition was great extent artificial, being nature's method improved by human agency, I am convinced that the public would en to the fact that it was in the highest degree necessary that the human agency should be made as perfect as possible, so that the danger of contamination should be reduced to a minimum.

There will be some difficulty in getting sanitary authorities in country districts to interest themselves in this question; in the towns it will be easier, partly because, as a rule, farmers are not directly represented on the Council, but principally on account of the dangers attaching to a contaminated milk supply being much more apparent amongst a condensed than a scattered population.

If, however, the public become thoroughly alive to the necessity of the milk supply being under control, the question of the exercise of such control will soon be settled. In the meantime something may be done, on the one hand to rouse sanitary authorities, and upon the other to educate public opinion by getting Public Institutions to adopt measures for the control of the milk supplied to them, by having clauses inserted in the contracts which will necessitate reforms being carried out, the nature of which will ensure a better price to the farmer for his produce, and the advertising of the conditions from time to time will attract public attention and attract customers to the dairy farm where such precautions are taken; and so farmers will find that it is to their self-interest to keep the quality and purity of the milk supplied by them at the highest possible standard of excellence, thus securing a decided advantage to the public, by appealing to the L.S.D. instincts of the dairy farmer.

> "For what is worth in anything,
> But so much money as 'twill bring."
>
> *Butler, Hudibras.*

The danger of the transmission of typhoid fever, diphtheria, scarlatina, &c., by infected milk is now so universally recognised that it is unnecessary to do more than mention it; but the fact needs attention that diarrhœa (sometimes of a fatal type) is frequently caused by young children drinking sour milk during the summer months, owing to no steps having been taken to cool the milk before it leaves the farm or dairy, thus permitting it to be in the most favourable condition for the reception of the Bacterium Lactis which abounds in the vicinity of dairies. To produce gastro-intestinal trouble in young and delicate children it is not necessary for the milk to be obviously sour, but "just on the turn;" and some of the outbreaks of diarrhœa which occur in wards set apart for children in general hospitals are undoubtedly due to this cause.

The gravest feature about the milk supply is the great, and elieve increasing, danger of the conveyance of tuberculosis, consequence of the large number of animals infected, which s been variously estimated at from thirty to forty per cent. herds.

From my own necessarily limited observation I have come the conclusion that the reason why some patients develop erculosis after typhoid fever is on account of drinking ected milk, when the powers of resistance are so reduced by fever that they fall easy victims to the onslaught of Koch's illus.

consider that at any rate some of the cases that have been ked upon as instances of mistaken diagnosis, viz., tuberculosis ing been regarded as typhoid fever, are in reality rapidly eloped tuberculosis following typhoid fever due to the causes ve mentioned.

y friend, Dr. Scurfield, who is intensely interested in the stion of the control of milk supplies, and to whom I am much ebted for information on certain aspects of the question, has, n initial step, got the Sunderland Town Council to admit necessity for such action being taken by communicating h various public institutions, and in this connection I have wn up a series of regulations for submission to the Com- tee of the Sunderland Infirmary for the control of the milk plied to that institution.

hese regulations I append as, when somewhat amplified, would suffice.

REGULATIONS FOR SUPPLY OF MILK.

Every effort to ensure cleanliness in milking to be made. udder of each cow to be properly cleansed, and the hands e milkers to be thoroughly washed with soap and water.

Where practicable the cows to be milked in a shed apart the byre. but if milking is carried out in the latter, straw manure must be removed at such hours as will render the as free from dust as possible at milking times.

The farmer to provide a cooler, and the milk to be pro- strained and cooled immediately after milking.

Any case of infectious disease (including consumption) in inmates of the farm buildings or any workers on the farm immediately reported to the Committee of the Sunder- Infirmary and the Sanitary Authority for the District.

A supply of pure water must be provided for the cattle, pecial attention paid to the freedom of ponds, &c., from e contamination.

The dairy to be separate from the house, and it, and the provisions for cleansing cans, &c., to be in accordance with the bye-laws under the Milk Shops and Dairies Order.

7. The regulations as to cubic space, ventilation, cleansing, and lime-washing of byres, as described in above-mentioned bye-laws to be strictly adhered to.

8. All the animals to be either tested with tuberculin or inspected by a qualified veterinary surgeon at least once every three months, by whom a certificate of freedom from tuberculosis must be given.

9. The milk must be of good quality, and a sample may be taken and analysed at any time by direction of the House Committee.

10. Every facility must be given for the inspection of the cattle and farm by the House Committee or any one deputed by them.

11. From time to time the Infirmary Committee shall advertise in the local papers the name or names of farmers who supply "Milk under Control," from cows guaranteed free from tuberculosis.

The most important point is, of course, the guarantee that the herd is free from tuberculosis, and this can only satisfactorily be given after testing with tuberculin, but as it will be almost impossible to get this carried out at first, a step will be gained by the periodical inspection of the herd by a qualified veterinary surgeon. When the time is ripe for the control to be vested in sanitary authorities, the regulations referred to could be amplified, and the tuberculin test instead of being permissive become obligatory.

While this would ensure purity of supply to large and regular customers, there would still be many consumers who do not depend upon any regular supply, but obtain the milk from peripatetic vendors, some of whom work on a very small scale, buying their supply from larger dealers and mixing and dividing it not unfrequently in their small and ill-ventilated dwelling-rooms. I have known this done in houses where typhoid fever was existent. Even in the case of those who act as distributors for some of the Dairy Companies adequate care is not taken, and in many cases the purveyors are not registered.

The milk generally comes from considerable distances and is hawked about the streets, and that which is not sold is taken to the cottage of the vendor when in an out-lying district, and, as I have actually seen, is sometimes stored in the washhouse while the family washing is being proceeded with, and remains there until the next day when it is sent to the central depôt, there to be sold at a cheap rate.

This supply to the poor cannot be controlled in the same ay as the supply to the better classes, as there would be ractically no incentive to the purveyors to follow out the gulations, if permissive, as no better price could be obtained om their customers.

In conclusion, I venture to affirm that everyone who has nsidered the subject and has seen the evils of the present stem, must come to the conclusion that milk supplies should under the direct control of sanitary authorities, but I fear is will not become so in the near future but will rather have be led up to by getting those connected with public institu-ns interested in the subject, and in this way at any rate the terest of a section of the general public would become aroused, d an increased demand for "Milk under Control" created, til the direct control by sanitary authorities would neces-rily follow, and one of the most important articles of food, in ct the most important as far as childhood is concerned, cease be the vehicle by which so often disease and death are con-yed into the household.

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solation Hospitals for Rural Districts," by ROGER MCNEILL, M.D.Ed., D.P.H.Camb.

(MEMBER.)

ABSTRACT.

ECTIOUS diseases are less prevalent in remote localities with rse populations than in large towns, and rural districts rounding them, or in frequent communication with them. ring the past two years infectious diseases were more valent in the rural parts of the counties of Midlothian, ark, Dumbarton, and Renfrew than in the towns of nburgh, Glasgow, Paisley, and Greenock, which are all ated in or near these counties. It is worth remarking that hese towns 43 per cent. of infectious cases were isolated in pitals, while in the rural districts surrounding them this aution was only carried out in 14 per cent. of the cases.

lospital provision for the isolation of disease in country ricts is essential, not merely for the protection of the rural ulation, but of the town population as well. If infection lowed to spread among communities near to or in frequent

communication with towns, the towns continually suffer, and no sooner is the disease extinguished in one part than it starts in another, while it spreads more rapidly and is more difficult to eradicate owing to the density of the population. Had preventive measures been generally adopted in country districts, town authorities would have been able to check infectious diseases more efficiently than they have hitherto done. This would in turn react favourably on the prevalence of disease in country districts. The Local Authorities of rural districts near to or in immediate communication with populous centres should take this phase of the question into consideration with the least possible delay. The area for efficient and uniform action should really embrace that occupied by the whole community; this, however, is rendered impossible by our system of local self-government.

In establishing Isolation Hospitals it is most essential that, even as a temporary provision, no hospital should be erected which is likely to bring discredit on our system of notification and isolation of infectious diseases; and it should be kept in view that large Isolation Hospitals can be erected at less cost, and that they can be managed more economically and more efficiently than two or more small hospitals providing the same accommodation and conveniences among them. With a view, therefore, to economy and efficiency it is desirable, so far as circumstances will permit, to provide the smallest possible number of hospitals, and these should be of sufficient size and accommodation to meet the requirements of the largest practicable areas. Different Local Authorities, both Burghal and Rural, should combine for this purpose. With a view to bringing about a combination of authorities where necessary, it might be better to delay the erection of separate hospitals for a reasonable time, rather than make provision that could not afterwards be altered. With properly constructed ambulance conveyances the hospital might be made to serve a large area. Where the population is sparse towards the boundary of a proposed Hospital area—the radius might extend to twelve or fifteen miles, as cases conveyed from long distances would be few—and where the condition of the patient necessitated a delay of removal for some days, the danger of the spread of infection would be less than in the more crowded centres.

The number of beds to be provided should vary in different localities in accordance with the prevalence of disease, the social position of the people, the house accommodation, and the population. A small population requires a larger proportion of beds per 1,000 than a large one.

Temporary and removable huts are not sufficient for rural tricts. Even in thinly populated districts permanent pro- ion should be made, and hospitals should always be kept in adiness for the admission of patients.

With respect to the disposal of sewage, typhoid, diphtheria, d cholera excreta should be burnt in suitable destructors. pensive destructors cannot be provided for small rural hos- als, but such provision is not necessary if the ground is of ficient size, and the site is reasonably isolated. Where no ver is within reach, the sewage may require to be filtered, ier through porous earth or artificial filters, before being charged into streams or on to a piece of land utilized for t purpose.

Vith regard to disinfection, A. B. Reck's apparatus is recom- nded for the larger class of rural hospitals, while for the ller hospitals, where time is not so pressing, Koch's cylinder, cribed by Flugge, steeping in a solution of corrosive subli- e, boiling, prolonged drying, and aerating may suffice.

Vith reference to hospital management, every hospital should under the management of a committee responsible to the al Authority. A resident medical officer should, if possible, provided. The relation of the Medical Officer of Health he hospital and the attendance of medical practitioners on r own cases in hospitals, are delicate questions. Whenever possible to find one practitioner, whether he be Medical cer of Health or not, who has the confidence of his colleagues he district, it is desirable that he should be appointed as pital Medical Officer in sole charge. These questions must ecided in different districts according to local considerations circumstances. Nurses should be permanently employed e larger hospitals, and in the case of the smaller buildings, ision should be made whereby the services of a nurse or es could be procured when required with the least possible r.

ie question of small-pox hospitals need not be discussed. rate provision is necessary for that disease, but in country icts it is now fortunately so rarely met with, and its spread be checked so easily by efficient vaccination and re- nation, that permanent hospitals are no longer required ot in the more populous localities.

is beyond the scope of the paper to enter into details ding the planning and construction of Isolation Hospitals, those wishing to study these matters are referred to a t by Dr. Thorne Thorne on "The Use and Influence of itals for Infectious Diseases"; an article by Mr. Percival on Smith, "On the Planning and Construction of Hos- for Infectious Diseases," published in the Epidemiological

Society's Transactions, Vol. II., 1882-83; and a volume on "The Prevention of Epidemics, and the Construction and Management of Isolation Hospitals," by myself.

Plans of ten different hospitals, with accommodation varying from four to sixty-four beds, were distributed at the meeting, and briefly described.

"*The Control and Supervision of Public Water Supplies by Sanitary Authorities*," *by* Charles Porter, M.D.Ire., D.P.H.Camb., M.R.C.S., Medical Officer of Health for Stockport.

ABSTRACT.

Water in sufficient *quantity* has always been a prime necessity of life and determining factor of human settlements. Similar anxiety as to its *quality* was by no means so general, and religious sentiment rather than sanitary motive was, even with the highly civilized Greeks and Romans, the principal cause of ancient prohibitions of pollution of sources of public supply. In our own time stringent enactments penalizing such befoulment exist (*vide* Waterworks Clauses Act, 1847) but are too often allowed to become a dead letter, despite the terrible lessons of the colossal power for evil of contaminated water afforded by the cholera and typhoid epidemics of the last half century. Reviewing the principal statutory water powers and duties of sanitary authorities, we find that the Public Health Act, 1875, enacts that any urban or rural authority may provide their district with a supply of water proper and sufficient for public and private purposes; and though the words "may provide" are permissive and enabling, if the local authority do not avail themselves of this power where water is required, and they can procure it, they will be in default, and can be compelled by the Local Government Board to make such provision (Ibid. Sect. 299). For the purpose stated the local authority may either contract with any person for a supply, or construct or purchase waterworks, and Sect. 55 orders that the local authority *shall* provide and keep in such waterworks a supply of *pure* and *wholesome* water. It is curious that the Public Health Act contains no such specific requirement in regard to *private* water undertakings, but this is met by Sect. 35 of the Waterworks Clauses Act, 1847, which requires such private persons or companies to provide and keep in the pipes to be laid down by them a supply of *pure* and *wholesome* water,

fficient for the domestic use of all the inhabitants within the nits of their area of supply. Within the service-area of a gally constituted company, a local authority cannot, however, nstruct waterworks (except for the supply of water for their m use), so long as that company are able and willing to supply iter proper and sufficient for all reasonable purposes for which is required; and Sect. 52 provides that any difference as to iat is proper and sufficient is to be decided by arbitration. r the Public Health Act, 1875, Sect. 70, any local authority is ipowered under certain conditions to obtain a justice's order the permanent or temporary closure or limited use of a blic or private pump, well, tank, or cistern. Lastly, the blic Health (Water) Act, 1878, Sect. 7, makes it a duty of ry *rural* sanitary authority from time to time to take such ps as may be necessary *to ascertain the condition* of the water ply within their district, and if there be reasonable ground believing that any house therein is without a proper and ficient supply of wholesome water, the authority or any of ir duly authorized officers are empowered to enter the ises in question *or the premises from which the water supply y be derived,* for the purpose of ascertaining whether such se has such a supply within a reasonable distance. Sect. 11 owers the Local Government Board to invest any urban itary authority with all or any of these powers, but, having ed the question in Stockport, I was advised by the Town rk that neither the general intention of the Act nor the ial wording of the Section appear to justify compulsory entry iny waterworks outside the district, and probably not inside; h depends on the meaning of the word "premises." *itary authorities outside the metropolis are, therefore, virtually iout any powers of compulsory supervision except in regard ells or pumps.* In the metropolis, under the Water Acts 1852 and 1871, the Board of Trade was authorized to luct inquiries and to invest inspectors with compulsory ers of entry, and of compelling information in regard to unsatisfactory supply, and the office of Water Examiner* created, the powers and duty of this official being to odically visit the filters, &c., of the companies to see that r supply was efficiently filtered. Such "efficient filtration" ely meant that the water should be "clear, bright, and free i suspended matter," crude and primitive requirements met by many very inferior sewage effluents, and notably by

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*his appointment is now apparently made and inquiries conducted by ocal Government Board, *vide* Min. Evid. R. Com. Metrop. Water Supply, par 12,909 et seq.

the cholera-laden water of the famous Broad Street pump in London. The London Water Examiner's work is supplemented by chemical and bacterial examinations of the raw river water, of the filtered effluent, and of water from the service pipes, by Dr. Edward Frankland, for the companies and the Local Government Board. The recent Royal Commission on the Metropolitan Water Supply has, however, strongly urged the appointment of an examiner with the fullest powers of compulsory entry and investigation, to supervise and report upon the purification processes. If this admirable recommendation be necessary for London, where the Official Water Examiner has been invariably admitted to the works "without hesitation and with all courtesy," how much more so is it called for in communities where there is no Water Examiner, and where private water companies, "tempted to choose between dividends and disease," too often resent with pious indignation any suggestion of shortcomings in quality or quantity of supply, and possible imperfections of source or purification. Adequate powers of inspection of all foods and especially milk already exist. It is, therefore, an unaccountable anomaly that although the lives and health of thousands may be endangered by impure water supply, *extra-metropolitan sanitary authorities are practically impotent where water is supplied by a company.* It is surely time that serious organized effort was made to obtain for the authorized officers of any authority full right of entry, inspection and sampling at any time to and in all sources, &c., of public water supplies, and especially in regard to works of water purification.

"*An Account of an Outbreak of Rabies in the County Borough of Croydon in the Autumn of 1895, and an Outline of the Anti-rabic Treatment by Inoculation at the Pasteur Institute,*" *by* LEONARD WILDE, M.D., M.R.C.P., D.P.H.

ABSTRACT.

DURING the autumn of 1895 rabies became prevalent in the Home Counties and led to the enforcement of the Muzzling Order.

Altogether six cases of persons bitten by rabid dogs were reported to the Croydon Health Department; one developed hydrophobia, and five of the victims were sent to Paris, at the expense of the Corporation, for treatment by anti-rabic inoculation at the Pasteur Institute.

The fatal case had been advised to undergo the Pasteur treatment, but declined on the ground that he did not believe in it. After an incubation period of 44 days symptoms of

drophobia made their appearance. Spasms and inability to allow fluids set in on the following day, and death took place the eighth day.

The anti-rabic treatment employed at the Pasteur Institute nsists of the inoculation of the virus of rabies, which has en modified by transmission through rabbits, and subsequent posure to dry air.

It was experimentally discovered that this virus has its ulence modified by passing it through different species of imals. Rabbits, guinea pigs, hens, monkeys are all sus- tible to it, and by a succession of passages through animals the same race the virus after a time reaches a fixed degree virulence. A virus which produces rabies in a rabbit on seventh day and causes death on the tenth day or later hat used for human inoculation and the perpetuation of the ease in other animals. The virus is located chiefly in the in and spinal cord, and if the spinal cord of a rabbit thus culated is removed and exposed to a current of dry air, it ound that the activity of the virus becomes less and less ording to the number of days it has been so exposed up to fourteenth day, after which it becomes inert and useless.

hese facts have been applied in the preventive inoculation tment. A number of spinal marrows are suspended in ks, the air inside which is kept dry by means of caustic sh. There is thus a series of fourteen marrows under- g various stages of desiccation. The fluid for inoculation repared by triturating a small piece of one of the drying rows in a little sterilized veal broth, and the first inocu- n is made by injecting under the skin from three to five c centimetres of the preparation of a marrow which has dried for fourteen days. The next inoculation is with nilar preparation which has been exposed for thirteen days, so on until the strongest preparation is injected. The ulation is repeated daily, and each injection confers pro- on against the next stronger one, until finally the patient oculated with a very virulent preparation which has only dried for three or four days. This last injection is equal tensity to the virus of a rabid dog.

he above is an outline of the treatment of ordinary cases, luration depending upon the number and situation of the . Persons bitten through the clothes and single bites on ands are given fifteen days' treatment; bites on the face ultiple bites elsewhere receive eighteen to twenty days. serious bites or those inflicted by wolves are subjected to is known as the "intensive method" of treatment, the tions being repeated twice daily, and the strongest preimmunisation much more rapidly reached. In some instances fresher marrows are occasionally used.

The intensive method is only employed in cases of great gravity, and is not free from risk; some few deaths have been directly attributed to it.

With regard to the efficacy of the treatment it may be remembered that M. Pasteur himself described it as prophylactic, and not in any degree curative. It is of no avail when the symptoms of hydrophobia have made their appearance, for hydrophobia once developed may be said to be always fatal.

In the absence of two series of exactly similar cases treated with and without anti-rabic inoculation, the only practical indication of the value of the method is a comparison of the death-rate from hydrophobia among every 100 persons bitten by alleged rabid dogs and not so treated, with the death-rate among every 100 patients submitted to the treatment.

The death-rates from hydrophobia among persons bitten by alleged rabid animals, published by the French Board of Health, for the years 1862 to 1872, are shown in the accompanying table.

From these and English records it may be roughly stated that of every 100 persons bitten by alleged rabid animals, 60 escape scot free and the remaining 40 develop hydrophobia; and, further, that every one of the 40 persons is inevitably destined to a terrible death.

The results of the anti-rabic vaccinations at the Pasteur Institute for the ten years 1886 to 1895, and the detailed results for 1895 divided into three categories, are also given.

According to these figures we find that notwithstanding the treatment, the mortality is about one per 1000; without it, as we have seen, it amounts to 30 or 40 per cent.

It may not be generally known that the heads of all animals suspected of having died of rabies may be now sent to the Brown Institution for confirmation by experimental means. This takes from 10 to 17 days, and it has been suggested that victims should await the result of such examination and allow this time to elapse before the application of preventive treatment.

If, however, the Pasteur treatment be decided upon, the necessity for early commencement cannot be too often repeated.

The certificate of a veterinary surgeon based upon the symptoms of rabies observed in the dog during life, supported by affirmative evidence at an ordinary autopsy, must therefore be regarded as sufficient to justify the application of the treatment without further delay.

Two other methods which are asserted to be curative may be briefly alluded to.

The Buisson treatment has been loudly advocated by many persons who are unacquainted with the pathology of hydrophobia. It consists of excessive sweating by means of Turkish and vapours baths. No doubt this form of "cure" has been successful in cases of "hysterical hydrophobia" where extremely neurotic individuals have imagined that they have been bitten by a rabid animal, and have excited themselves into a condition of spurious hydrophobia, but in these cases any or no treatment would have been equally efficacious. Moreover, the statistics furnished by the exponents of this method have never been convincing, and except as a speculative venture it has fallen into disuse.

On the other hand another method based upon the principle of serum therapeutics, which has proved so successful in the treatment of diphtheria, has been quite recently applied to rabies, and in the near future may possibly take the place of Pasteur's vaccination process. It is claimed for the anti-rabic serum treatment that it is more efficacious and more convenient than the rather lengthy Pasteur method. It acts with great rapidity, and an animal injected with the serum becomes protected within a few minutes. One injection will save an inoculated rabbit although applied at an advanced stage of incubation. It can, therefore, be employed at a much later period of incubation than was possible under the Pasteur method. The preparation of the serum can be preserved in a dry form, forwarded through the post and applied by any medical man throughout the kingdom by injection under the skin.

Should this anti-rabic serum method prove efficacious in its application to man then possibly the decision of the Brown Institution may be awaited without too great a risk.

Death-rates from Hydrophobia among Persons Bitten by alleged Rabid Animals.

FRENCH BOARD OF HEALTH, 1862 TO 1872.

	Number.	Deaths.	Percentage.
Bites on the Face	50	44	88·0
" Hands	113	76	67·25
" Trunk	22	7	31·81
" Arms	40	12	30·0
" Legs	33	7	21·21
Multiple (Face, Hands, &c.)	8	6	
	256	152	

Results of the Anti-Rabic Vaccinations at the Pasteur Institute for the Years 1886 to 1895.

ANNALES DE L'INSTITUT PASTEUR.

Years.	Persons Treated.	Deaths.	Mortality per cent.
1886	2,671	25	0·94
1887	1,770	14	0·79
1888	1,622	9	0·55
1889	1,830	7	0·38
1890	1,540	5	0·32
1891	1,559	4	0·25
1892	1,790	4	0·22
1893	1,648	6	0·36
1894	1,387	7	0·50
1895	1,520	2	0·13

Results for 1895, divided into Categories A, B, C.

A. Rabies Experimentally Confirmed.
B. Rabies Certified by Veterinary Experiment.
C. Animal Suspected of having Rabies.

	Bites on the Head.			Bites on the Hands.			Bites on the Limbs.			Totals.		
	Treated.	Deaths.	Mort.	Treated.	Deaths.	Mort.	Treated.	Deaths.	Mort.	Treated.	Deaths.	Mort.
Class A...	18	0	0	62	0	0	42	0	0	122	0	0
Class B...	108	0	0	555	1	0·18	286	1	0·35	949	2	0·24
Class C...	30	0	0	212	0	0	207	0	0	449	0	0
Totals ...	156	0	0	829	1	0·12	535	1	0·18	1520	2	0·13

"*Some Duties which will devolve upon Municipalities in connection with the Public and the Submerged Tenth,*" *by* R. SYDNEY MARSDEN, M.D., D.Sc., D.P.H., F.R.S.Edin., Medical Officer of Health for Birkenhead.

(MEMBER.)

ANYONE who occupies himself with sanitary problems of reform, must sooner or later have his attention turned to the great question of how we are to deal with the outcasts of Society to whom we commonly allude as the "Submerged Tenth."

The housing of these people, the reforming of their habits of life, and the improvement of their general sanitary surroundings, forms one of the most difficult problems with which Municipalities have to deal; and, in my opinion, the study of this social sanitary question at the present time deserves to fix the attention of Medical Officers of Health.

In every country it is beginning to attract much attention, d will soon occupy a prominent position in the minds of ıitary and social reformers.

It is beyond a doubt that a profound work of decomposition d of reconstruction will have to be undertaken, and whoever ı are, whatever may be your *speciality*, as health experts you ınot remain indifferent to this movement, for it surrounds ı on every side. Whilst Acts of Parliament are being ained day after day by our different Municipalities for the truction of the loathsome dwellings in which these people at sent live, no proper consideration is being given to the ple themselves after they have been turned out (although it ms a natural sequence that both should be dealt with ether); the result is that they simply go into other better ses and soon convert them into similar hovels to the ones n which they have come, and thereby cause a general depression in value of the property in the district to which they e wended their flight.

'he question therefore naturally arises, How are you going leal with these people? How help them to attain to a ıer and more healthy form of life for both body and mind? merly the solution of this problem was very simple. On one hand there was the counsel of ascetic charity—give ı; on the other the all-sufficient political economists said: world progresses in accordance with natural laws; the uggle for existence" goes on in the midst of society as well n the forest or the sea, and those best adapted to the ımstances surrounding them—the strong survive, the weak ıh, and thus we progress. Therefore, let them continue in present condition to be annihilated gradually and slowly isease and want, according to natural law and the circumces of their environment.

ıt we can no longer accept either of these solutions of the ulty. Charity has failed, and must of necessity fail, to t such a change as is required; whilst the modern doctrine truism protests against nature being left to work her own t will, for the strongest to triumph and the weak to go to rall. And at the same time the rest of the community out for protection against the evils accruing from the nt form of life of these neglected people. We need, thereto reconsider the question.

even nothing can be done for the adult population of our t slums, the, as yet, uncontaminated child-life cries for r surroundings. There is a growing feeling amongst the t and best of our citizens that something will have to be by our great Municipalities to remedy this evil and imthe conditions which surround them.

It is a question of economics not less than one of sanitary importance, for anything which tends to seriously impair the capacity for labour in the health and physical and moral well-being of the people becomes a national calamity; and if we are to get any real advance we must commence at the lowest step of the ladder with the new life which has not yet received its final impression. Let us assume for the present that the mass of persons forming any given community have a right to be protected from the evils and dangers accruing to them from the thriftless, filthy, and demoralising habits which attend and accompany the present form of existence of these sediments of society, and I consider that the community has a right to interfere with the personal habits of such people as are either incapable or unwilling to live in such a manner as not to be a danger to the public health in its widest sense. How then shall we approach this problem? Permit me, in a few words, to tell you what I think of it. In the first place I do not expect here to-day to get any efficient and immediate answer as to how to grapple with the difficulty.

The problem is too great to be dealt with in a few minutes' consideration, but what I aim at is an interchange of opinion amongst us, with a view of setting a ball rolling which shall ultimately crush out of existence the present insanitary conditions of our slums.

We must first consider as to whether a man or woman, who has drifted so low in the human scale as to be totally unfit to carry out even the most ordinary functions of domestic life and parental duty in a satisfactory manner, ought not, *ipso facto*, to be compelled by law to pass into a *scheduled class*, in which they shall be under official inspection of the Sanitary Authority of their district.

If, under such conditions, they do not improve, they should be compelled to reside in certain public dwellings, constructed something after the model of the best form of common-lodging house, provided with proper means of washing and personal cleanliness, and they should be compelled to conform to the regulations in force. Each inmate would be provided with a separate bed, whilst the sexes would have to occupy different apartments, so as to prevent further increase of the families which they had already proved themselves unable to support and bring up in a proper manner. The children would have to be taken care of, as they are at present in the workhouse, and thus brought up under more favourable conditions of body and mind with better external influences—whilst personal cleanliness would be enforced upon all. In return for these beds and general dwellings the adults would have to pay such sum per week to the keeper (or do an equivalent amount of ›rk) as would just pay the expenses entailed by them, and if ey refused to do so, they ought then to be passed on solutely to the workhouse, and put under the pauper-master d the Poor Law Government. There would thus be no lucement to them to continue under municipal shelter longer an they were absolutely forced; indeed, the fact would have be constantly pressed on them that residence in these elters was to be only a temporary means to an end, with the rpose of helping them, and to give them a chance of getting o a better state of life, and with a view to their going out in to start new homes under more favourable conditions.

Thus they would gradually learn the laws and comforts of anliness and personal tidiness in dress, which would ulti- tely react on their moral nature, and make them feel that y might after all, with a little effort on their own part, ome respectable members of the community.

cannot help thinking that a large proportion of them ıld gladly avail themselves of such an opportunity of reclaim, ecially such as had formerly known better times; and under circumstances the children would be removed from the ıence of their present dreadful surroundings and thus given ance at least of becoming useful members of society.

should like to hear the views of my fellow medical officers his subject, and hope it may receive adequate discussion. pe also that they will get their authorities to consider the ition with a view to representations being sent to our ernment, telling them that we require special powers to with the existing state of affairs, and that it is their duty ome to our assistance, and to make it possible for us to this class of people from their present condition to one fitting their position as members of a great and civilized munity.

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hole-time service' of Medical Officers of Health versus *'Part-time service,'" by* F. J. Waldo, M.D., Med. Off. Health, The Temple and St. George's, Southwark, *and* David Walsh, M.D.

NOTE.

conclusions arrived at by the authors of this paper are llows:—

The Medical Officer of Health should be, except under imaginable but rare cases, a "whole-time" man.

[illegible] That whenever possible he should have some previous experience of actual medical practice.

[illegible] That the "whole-time" man is more likely to be in touch with his brother medical practitioners.

[illegible] That such appointments are generally speaking to be considered on much the same ground as "part-time" service.

[illegible] That an adequate salary is necessary, and that security of tenure must be absolutely secured for competent officers.

[illegible] That in scattered rural and small urban districts the sanitary authorities may be centralized, and united into a joint Sanitary Authority.

[illegible] That no existing "part-time" posts be abolished without compensation.

[illegible] That the matter of "whole" or "part-time" employment receive the most careful investigation and report by a special committee appointed for the purpose.

"Are Coal-miners exempt from Cancer?" by THOMAS OLIVER, M.A., M.D., F.R.C.P., Physician to the Royal Infirmary, Newcastle-upon-Tyne.

(MEMBER.)

ABSTRACT.

In the "Birmingham Medical Review" for October, 1895, appears a paper by Mr. Law Webb in which he shows that the [illegible] colliers enjoy a remarkable immunity from cancer; in the present paper Dr. Oliver sets forth the results of an investigation as to whether such immunity is extended to the miners of Northumberland and Durham.

During the [illegible] years ending June, 1895, 1,211 coal miners were admitted into the Royal Infirmary, Newcastle-upon-Tyne; [illegible] suffered from some form or other of malignant disease. Of the Northumberland miners admitted, 4·6 per cent., and of the Durham miners 6·6 per cent. In the Durham Infirmary, among the coal-miners admitted, the [illegible] 2·1 per cent., and in the Durham County [illegible] 2·2 per cent.

[illegible] points out that it is impossible to gauge with accuracy the amount of cancer prevalent even among the coal-miners by simply taking the statistics of the Newcastle Infirmary, but he maintains that s to this institution most miners would come at some time or ier of their illness.

From the official returns of the coal miners engaged in rthumberland, and from the material which he has collected m the above-mentioned three institutions, he finds that the icer returns of total coal-miners working in Northumberland respond to 0·05 $^{\circ}/_{0}$, and in Durham to 0·065 $^{\circ}/_{0}$—spread over eriod of nearly five years." Over England and Wales ierally the deaths from cancer amount to 0·07 $^{\circ}/_{0}$. These ires demonstrate—(1) That the coal miners of Northumber-d and Durham are not exempt from cancer; and (2) That ile they have no special immunity from this disease they do appear to be more predisposed to it (as Montagnon has ntained), but suffer less than the general population.

t is tempting to speculate upon the explanation of the arkable circumstance that whereas chimney-sweepers—a s of men whose work brings them into the closest contact i the products left by the incomplete combustion of coal— specially liable to cancer, coal miners have no special lency to this disease. Dr. Oliver remarks, "In the case of chimney-sweep the cancer has been attributed to friction of y clothes, want of washing and keeping the body cleanly, and ie irritant or chemical action of soot upon the skin. It is rly not due to mechanical irritation, otherwise the miner imed with coal dust, whose clothes are also dirty and whose c is hard and exposes the skin to great friction, would not y such comparative immunity from the disease. A chemical ige therefore must occur in coal when burnt, whereby the acquires, in some way or other, chemical and cancer ucing qualities not present in the coal itself. So far as the mey sweeper is concerned Mr. Butlin has stated that it is oot of hard coal that is most productive of cancer."

s *Difficulties and Duties of the Medical Officer of Health under the Notification of Infectious Diseases Act,"* by WILLIAM BERRY, F.R.C.S.I., D.P.H., Med. Off. Health for Wigan.

NOTE.

his paper Dr. Berry dealt chiefly with the difficulties he had experienced from receiving notification certificates h were, owing to errors in medical diagnosis, incorrect. difficulties which arose when the certificates were not irded with the necessary dispatch were also discussed.

ENCE OF MUNICIPAL AND COUNTY ENGINEERS.

[illegible] of the Conference commenced with an address [illegible] Mr. J. C. May, M.Inst.C.E., published in the [illegible] XVII., Part III.

[illegible] *and Drain Pipes,*" *by* R. S. ROUNTHWAITE, Assoc. M. Inst. C.E.

ABSTRACT.

[illegible] introductory remarks having reference to previous [illegible] of pipe jointing, the author proceeded [illegible] many of the members of that Association [illegible] County Engineers) and by many who were [illegible] aware that clay jointing was looked upon [illegible] and ignorance; nevertheless, he was, [illegible] information and experience, in favour of it as [illegible]

[illegible] with his paper the author gave shortly [illegible] the subject at that conference, and [illegible] discussion would result.

[illegible] great difference of opinion which [illegible] between gentlemen who were daily [illegible] works of sewerage, and who were [illegible] capable of judging as to what was best [illegible] the author ventured to think that [illegible] when any fixed hard and fast rule [illegible] be laid down, and he was, moreover, [illegible] that the professional adviser of a sanitary [illegible] had any lengthened experience in [illegible] was the person best able to judge [illegible] material to use. He contended that [illegible] depended on the quality of the clay [illegible] and also referred to several [illegible] the lapse of a very few years, he had and work executed with cement joints to have been defective om end to end.

With the view of ascertaining the practice and experience of e Engineers to other Corporations, the author had addressed eries to these gentlemen on the subject, and briefly alluded the replies received.

The objections urged *against* cement jointing were, in his inion, by no means few or insignificant, and were considered the following order, viz.:—

(1) There cannot be sufficient certainty that in the execution the work the joint is carefully and properly wiped off on the ide, and that no ridge of cement is left inside to harden the joint. The *least* carelessness at this point will undoubty cause an accretion of sediment, which will grow and grow il it attains such proportions as must result in serious osits, and the consequent generation of noxious sewer gas.

2) Neither can there be any certainty that after the pipes jointed, and whilst they remain uncovered, workmen will walk or step upon them. With every care and supervision will occur, and to a cement joint especially must be and isastrous.

3) After the joints are made and set, or partially set, the ior is not by any means satisfied that the weight of earth ig, together with the process of filling and *ramming*, does cause *some* degree of subsidence, or *sufficient and unequal* lement to fracture the joint.

) In case of such fracture leakage is almost certain to take e, and must eventually result in subsidence of the adjoining s.

) In making branch connections with a sewer or drain ed in cement, and in case of a stoppage in pipes similarly ed, it becomes necessary to break away and remove several before being able to secure a perfect socket for making .; and further, in making good such pipes with cement, not possible to wipe off inside the cement joint, so that a is necessarily left.

) The author considers that any jointing medium should it of some slight yielding in order that fracture and conent leakage may be prevented.

e said it was all very well to stipulate that the earth ld be hollowed out to the exact shape of the under half of ody of the pipe and of its socket, but they all knew that ractice that was *not* done, and therefore there *must* be ment in a greater or lesser degree.

also said it was worthy of note that in *many* towns it was ractice to lay a clay band or collar *over* the cement joint;

and this appeared to him to indicate a want of *faith* in the cement joint alone.

Replies to queries had been received from the engineers of eighty-five of the principal cities and boroughs in the United Kingdom. These replies were shortly tabulated, and showed a most extraordinary diversity of *opinion* upon the question, and the author suggested that whilst the engineers of such cities and boroughs as Middlesborough, West Hartlepool, Hull, Sheffield, South Shields, Stockport, Oldham, Birmingham, Bolton, Belfast, Blackburn, Bradford, Leicester, Rochdale, Cork, Derby, Wigan, Gateshead, Gloucester, Newcastle-on-Tyne, and many others adhered to the practice, and believed in the use of clay in preference to cement, there was much room for doubt as to the superiority of the latter. A very large number of those gentlemen even *who used cement* expressed much doubt as to its efficiency; and, indeed, in one case the surveyor openly avowed that he *preferred* clay; in several other cases that cement was *not* satisfactory; whilst many considered that there was "always a great risk of failure," that it was "rigid and liable to crack, and required *great* care and supervision."

The objections urged against the clay joint were—

(1) Rats sometimes scrape away the clay.
(2) Worms bore through it.
(3) Roots of trees grow into the joints and fill the pipes.
(4) Joints do not remain watertight.
(5) Clay cracks in dry positions.
(6) Joints are forced when under pressure.

As to objection No. 1: It might be possible for a rat to scrape away a small portion of the inner clay, but nothing further.

As to No. 2: Worms would no doubt sometimes, though very occasionally, be found in a clay band.

As to No. 3: No one would think of using clay where tree roots were likely to be.

No. 4: The assertion that the joints did not remain watertight was not, in the author's opinion, correct.

No. 5: That clay cracked when laid in dry positions might well be; but when was a cutting in clay or ordinary earth, five or six feet deep, found to be wanting in moisture?

No. 6: That the joints were forced when under pressure. Did not this depend on *how* the joints were made and stemmed? If a properly made clay joint would, without any support from the adjoining or superincumbent earth, stand a head equal to six feet of water (about which there was no doubt), and the trench was properly packed, filled in, rammed and consolidated, the author did not quite see how even an extra three or four feet of head was likely to overcome the resistance of the earth.

In Wolverhampton and Portsmouth it was stated there were many clay-jointed sewers which, after twenty years, were found to be as good as when first laid.

The author's contention was for some jointing material which would be sufficiently pliable and elastic to yield *slightly* in case of subsidence which might have been caused in any of the ways before mentioned. With a rigid joint, such as cement, something must give in case of settlement; either the joint or the pipe. In this relation the author quoted remarks made by Mr. G. F. Deacon, M.I.C.E., in his address to the Engineering and Architectural Section of the Liverpool Congress (1894). He there said, "I may be permitted . . . to point out that—except in very shallow cutting and suitable ground—you cannot, speaking generally, without greatly increased cost, make stoneware pipes with rigid joints permanently watertight. Even cast iron pipes are commonly broken by irregular external pressure in deep trenches, under the conditions to which stoneware pipes are sometimes subjected. As an example, stoneware pipes of 15″ internal diameter, of good manufacture, jointed with Portland cement, and supported on bearings 8′ 6″ apart, will only deflect, before fracture, $\frac{1}{30}$″. In most trenches more than a few feet in depth the unbalanced pressures (caused by irregular settlement of the filled-in materials, which with the greatest care cannot be avoided) largely exceed what is necessary to produce a flexure of $\frac{1}{30}$″ in 8′ 6″ of cement-jointed stoneware pipes. Thus we find in a large proportion of such work that the pipes are frequently fractured. We also find that with the closest inspection it is most difficult to secure watertightness in ordinary cement-made joints."

"*Treatment of Crude Night Soil with Acidulated Ashes*," by HERBERT JONES, D.P.H.Camb., Medical Officer of Health, Crewe.

(MEMBER.)

IN those districts where water carriage is entirely absent or only partially prevalent, and where pail closets or cesspool privies are in use, there is very frequently great difficulty in disposing of the resulting crude sewage. This difficulty, too, is perhaps felt the most in towns of medium size, say between 20,000 and 40,000 inhabitants. In a small town the relatively small amount of sewage produced is generally taken away by neighbouring farmers, and on the other hand a large county borough is in a position to lay down more or less costly plant, and so convert the bulky night soil from an offensive unmanageable semi-liquid manure into a dry concentrated and inoffensive fertiliser.

But there are a large number of towns unable to adopt either of these methods, where it is only possible to induce farmers to take crude night soil during the five or six months of the year in which the land is in a condition to receive it, as they are rarely, if ever, willing to undertake the double cost of cartage entailed by storage during the summer months. For one-half of the year, therefore, the sanitary authority must look elsewhere for the disposal of what is undoubtedly a valuable commodity.

I venture to think that the process I am about to describe will overcome this difficulty of storage, and will enable authorities to convert their night soil into a dry portable and inoffensive manure, which may be stored for any length of time and then dealt with during any portion of the twenty-four hours without creating any nuisance, and this, too, without a greater capital outlay than a few pounds.

I will proceed to detail the method as it has been carried out during the past fifteen months at Crewe—a town of nearly 8,000 houses, rather more than 2,000 of which have pail closets and about 5,000 dry ash pits or sanitary dust bins, the contents of the last two being emptied at least once a fortnight. First of all the dry ashes—and by this term you will of course understand me to mean ashes minus excrement—are screened by being thrown upon an ordinary hand screen 6 ft. by 3 ft. The finer portion of the ashes is then sprinkled over from a leaden watering can with commercial sulphuric acid to the extent of about 4 per cent. weight for weight. The acidulated ash dust is then formed into a kind of rectangular pie-dish, 10 ft. by 6 ft., with sides 18 inches high, the sides and bottom being about 10 inches thick. Into this "dish" is emptied during the night time the privy pail contents in the proportion of about one ton of night-soil to one ton of ashes. The following day the mixture is well mixed together with a long rake much as hand-made mortar is manipulated.

I need not point out to you that the volatile carbonate being converted by the sulphuric acid into the more stable sulphate of ammonia there is an almost entire absence of smell; moreover, after the mixing has been completed there is no occular evidence of the presence of night soil in samples taken from any part of the heap. The whole process has been carried out in a most primitive manner in one corner of a field on our sewage farm, one man screening three tons of the ashes daily. The cost of mixing and screening, together with the sulphuric acid has been 1s. 6d. per ton of the completed manure. No doubt the constituent parts of the contents of dry ash-pits will vary in different towns; we find, however, that six loads straight from the houses yield on an average one load of tins, brickbats, crockery, &c., two loads of coarse ashes, and three loads of fine ash such as we can acidulate. Though it is no part of the process proper, it may interest you to know that we burn the coarse ashes in lieu of slack in an ordinary Cornish boiler which supplies steam for the sewage farm pumping engine, and although it may be true that every district is not so fortunate in having such a ready means of disposing of this portion, yet it must be conceded that even in a town which may at present deposit all its dry ashes in a "tip," the objections to this method are certainly not increased but rather are they lessened by taking away one-half of the matter to be "tipped," and that half very objectionable in that it is capable of being blown about hither and thither.

I should here point out that after a year's trial of the process employing only an ordinary hand screen, and carrying out the whole work in the open air, its success has been sufficiently assured to justify the Corporation in putting down a mechanical screen worked by the pumping engine, and in erecting shedding under which the screening and mixing can be carried on so that no additional moisture is added from rain, as this has hitherto diminished the value of the resulting manure, the farmer desiring it in as dry a condition as possible.

And now as to the value of the manure from the agriculturalist's point of view.

Although on our sewage farm of nearly 300 acres we had ample opportunities of arriving at definite conclusions, it was considered advisable to supply some of the farmers in the district with the manure that we might obtain a more comprehensive estimate of its value, and through their courtesy I am able to give you the results obtained. Dealing first of all with our own farm, the farm manager, Mr. J. Woodhouse, reports as follows:—"Early in August of last year upon a portion of a field on which the Railway Company had thrown up a large spoil bank consisting of nothing but pure clay, was strewn from the tail of a cart the manure at the rate of about ten tons to the acre. This was a very rough piece of land, and the stock fought shy of it, but a few weeks after the manuring, all the old grass was grass, and a short, sweet, velvety bed of white clover, 'natural,' has taken its place, and has always been kept very bare by the stock ever since. (2.) Another spoil bank two acres in extent which had let in previous years for 30s., was treated to a liberal dressing of the manure, in fact instead of drawing a cart load into six or seven heaps, at a distance of seven or eight yards apart, as is usual in the case of farm-yard manure, a small load was tipped up together in one heap at a distance of seven yards from a like quantity. When this was spread the land looked quite black as though there was no grass at all on the field, but in a very short time the grass broke through, and such was the prospect of the land that it was readily let for £9 to a labourer, and it has kept two cows, besides giving him a nice stack of hay. (3.) In a disused piggery with a brick floor there was prepared a bed consisting of a thin layer of sods, then about three inches of manure and a thin covering of soil on the top. Into this were transplanted about fifty tomato plants, 2-inch apart. They are now strong sturdy plants covered with fruit." Mr. Woodhouse's estimate of the value of the manure will be gathered from the above. He says further, "the greatest boon in the application of this manure to a crop is, as a farmer remarked the other day, 'there is only one wrong time to apply it, and that is when you cannot get it.' It can be applied with the greatest advantage after you have cleared your stock from the meadows in the spring, as it is at once washed into the ground, and there is nothing to catch either mower, tedder or rake. In the same way it can be applied as soon as the hay is in the cock or the field is cleared and stock can at once be turned out. It can be applied to root crops now with the greatest advantage, thereby saving all the labour and loss of time in spring manuring, besides being much better and less liable to 'fly.' Its mode of application is simple in the extreme."

In the middle of July, 1895, a portion of a field belonging to Mr. A. was covered with the manure ten tons to the acre, the grass was nearly all burned away by the prolonged drought, but happily rain fell within a few days and at once a marked change took place on the manured portion of the field, the grass at once assumed a vivid dark green hue, and the stock took it with avidity almost eating the grass into the ground, whereas the remainder of the field did not recover from the drought for more than a month afterwards.

Mr. B's trial.—On a seven-acre field of strong loam with a clay subsoil, which in the spring of 1895 was manured with five cwt. of basic slag per acre, there was applied in February this year, as to five acres twenty-five cwt. of superphosphate of lime, as to an acre and two-thirds farmyard manure (fifteen tons per acre), and as to the remaining one-third of an acre three tons of ash manure. The grass was cut in July, and there was no very material difference in the crops from the different parts of the field, if anything it was in favour of that manured with the ash manure.

Mr. C. applied three tons to an acre of grass land adjoining a much frequented high road, and Mr. D. about fifty tons to meadow land, the report from each being of a satisfactory character.

I have no wish to over estimate the value of the process which has been described, it is not one of those we used to hear of some few years ago, the adoption of which was to relieve the long-suffering ratepayer from half his rates, but I do think that if properly carried out in suitable districts a certain amount of the present anxiety of sanitary officials may be saved, and we shall also be able to falsify the charge so often brought against us of recklessly squandering valuable fertilising material.

"*Sewerage and Sewage Disposal of Colliery Villages,*"

J. E. PARKER, ASSOC.M.INST.C.E.

(MEMBER.)

ABSTRACT.

MANY of the colliery villages in the north of England are without systems of sewerage, or sewage disposal. The sewage, which is usually free from fœcal matter, has for years been conveyed from the dwellings by means of surface channels laid parallel to the colliery rows of houses, and these channels are a source of nuisance.

As the surface of the ground is liable to subside from mining operations, it is consequently necessary to avoid laying down long lengths of outfall sewers, and therefore it is not always expedient to convey the sewage to one outlet whereat the sewage may be treated. The Public Health (Support of Sewers) Act, 1883, can be applied in order to obtain support for the sewers, but the value of the coal required to be left, unworked, in the mine for this purpose renders the cost prohibitive.

The population of colliery villages usually varies from about 5,000 to 200 persons, and the ordinary glazed stoneware pipes with cement joints usually suffice for the construction of the

sewers, broken at intervals by manholes, inspection chambers, &c. Large quantities of coal and cinder, in very fine particles, are carried with the sewage to the outfalls; but in the summer time the fatty matter and these substances form a gelatinous compound, which adheres to the glazed surfaces of the pipes, and, unless adequate flushing is provided, decomposes there, and gives off foul odours from the surface ventilators.

It is impossible to apply any one system of sewage disposal works to a number of cases as the local conditions will frequently vary. Broad irrigation may be advisable in one case, intermittent downward filtration in another, and chemical treatment in others, or these several systems may be combined with advantage. The experience of the author, derived from the design of a number of schemes of sewage disposal on these different principles, and the management of the works after the completion, is that where suitable land can be obtained the sewage can be cheaply and efficiently dealt with by the intermittent downward filtration method, but unless the land is suitable and free from clay it is a mistake to attempt to treat sewage in this way. When suitable land cannot be obtained near a colliery village for sewage filtration, then the author is of opinion that the sewage should be disposed of by means of chemical precipitation, and the supernatant liquid filtered through artificial filters. Very good results have been obtained by the author by treating the sewage with aluminoferric, passing it through continuous flow precipitation tanks, and filtering it through sand, gravel, coke-breeze, and a substance called claritove.

Broad irrigation is an expensive method of dealing with sewage, and the effluents therefrom, if there is any clay in the subsoil, is, as a rule, unsatisfactory. Classifying the systems above referred to in the order of merit, in which efficiency and economy are factors, the author thinks that intermittent downward filtration should be placed first, chemical treatment second, and broad irrigation last.

A paper was also read by F. C. LYNDE, Assoc.M.Inst.C.E., *On "Improved Methods of Drainage Construction."*

NFERENCE OF SANITARY INSPECTORS.

proceedings of the Conference commenced with an address the President, G. Reid, M.D., D.P.H., published in the rnal, Vol. XVII, Part III.

"*Sanitary Work in Rural Districts*," *by* William Bland, Sanitary Inspector.

(Associate.)

ABSTRACT.

present is a very opportune time for Sanitary Inspectors onsider this question. At the last Congress held in Liver- Mr. Davenport read a paper on "The Parish Councils Act, ffect upon the position and duties of the Rural Sanitary ector."

rior to 1872 Rural Sanitation had been very much neglected, idenced by the Privy Council Reports. The Public Health , 1872, requires the appointment of Medical Officers of lth and Inspectors of Nuisances. To this requirement is buted the progress made which led up to the passing of the lic Health Act, 1875. At this period Rural Sanitation receiving attention ; authorities had awakened to the irements of their districts, and were now in possession of r to meet them.

ttle was then known of those true principles of sanitation h are now in evidence. Powers given to Urban Authorities denied to Rural Authorities, chief of which (Sect. 157) respect to new buildings, which ought to have been com- ry. In consequence of this, unsuitable property has been up in rural districts, thus increasing the difficulty of ation. The time has arrived when a Code of Laws should acted for new buildings, to be enforced in every district.

e Public Health Water Act, 1878, was a welcome addition ral authorities' power. Section 6 renders it unlawful to it a new house unless and until the Sanitary Authority certified that a sufficient supply of water is available.

e additional powers which may be adopted by Rural orities are all valuable when they have been brought into nd in conjunction with the 1875 Act must have a beneficial effect upon public health when administered by a good authority.

The expenditure incurred by Rural Sanitary Authorities on water supply, sewerage, and sewage disposal, and the annual amounts expended from rates, further indicate the good work done.

By the Local Government Act, 1894, a change is made in the name of Rural Authorities and the old mode of election changed, which must make sanitation more prominent, as Rural District Councillors are elected as such instead of being elected members of Boards of Guardians.

All Rural District Councils may by order of the Local Government Board be invested with Urban powers, under the Public Health Acts or any other Acts.

The creation of Parish Councils bears upon sanitation, certain powers being given to deal with water supply and nuisances. It is suggested that Rural Sanitation would be advanced by Parish Councils being made into Parochial Committees, as provided by the 1875 Act and amended by the Parish Councils Act.

The Inspector's position should be improved in rural districts, provision being made for reaching every part of his district, and better salaries should be paid to make it worth while to run risks in execution of duty.

Conclusion being that it is within the power of Rural Councils to make life in their districts all that could be desired.

"*The Spread of Scarlet Fever,*" *by* TOM STAKE.

(ASSOCIATE.)

ABSTRACT.

THAT scarlet fever, which is acknowledged to be preventible, should still fill our hospitals shows that there is still work for sanitary reformers to do.

There is no reason why scarlet fever should not be almost unknown within the next decade.

Carelessness and ignorance is the cause of its continuance; carefulness and a better knowledge of its symptoms by parents and teachers, the antidote.

Every case of sickness with sudden onset should be carefully watched and the doctor called in, as such cases are sometimes mistaken for measles, and is one reason why measles should be notified.

When the source of infection is not traced the inspector should, if possible, make a house-to-house inspection in the neighbourhood with a view of finding mild cases which have not been notified.

Teachers should acquire a better knowledge of the symptoms, and all cases of sickness in school should be reported to the parents.

Every infectious hospital should provide for the isolation of doubtful cases, and parents be assured that such cases will be returned home as soon as the diagnosis is without doubt.

Scarlet fever patients with running ears or nose, should be, if possible, kept in hospital until quite better, and when returned home the parents should be warned of the infective character of the runnings.

Medical officers of health should have power to order all patients to hospital who are in his opinion without proper isolation and nursing.

Not only the patient's bed and clothing but all young children's, along with the mother's or nurse's clothing should be thoroughly disinfected. This is difficult to do among poor people with no change of clothing, and to meet this want Professor Delapene, of Owen's College, Manchester, has designed a portable disinfector.

The Infectious Diseases Notification and Prevention Acts should be made compulsory, and the Local Government Board should insist on a more uniform, consistent, and thorough carrying out of the Public Health Acts.

"*The Duties of Sanitary Authorities in relation to Factories, Workshops, and Shops*," *by* THOS. FOLEY CASS, Factory and Workshop Inspector.

(ASSOCIATE.)

ABSTRACT.

THE duties of local sanitary authorities in respect to factories do not extend beyond the Public Health Acts, excepting the fire-escape clauses of the Factory and Workshop Act of 1891.

Section 101 of the Factory and Workshop Act, 1878, exempts factories from sub-section 6 of Section 91 of the Public Health Act, 1875, but declares that the Public Health Act, 1875, shall apply to buildings in which persons are employed, whatever their number may be, in like manner as it applies to buildings where more than twenty persons are employed; so that all factories are houses and should, therefore, be inspected as other houses, from time to time, in order to ascertain what nuisances call for abatement.

Much good may be done by such inspection of factories, for drainage nuisances seem to abound, especially in old factories; and it is no uncommon thing to find the closet accommodation in terribly insanitary conditions from neglect, and in some cases of a most disgusting character.

Section 22 of the Public Health Acts Amendment Act, 1890, enacts that local authorities may enforce, on report of their Surveyor, provision of sufficient and proper sanitary conveniences at manufactories, and where both sexes are employed, proper and suitable sanitary conveniences for the separate use of the sexes. This seems to have received very little attention, so far as factories and workshops are concerned. I think you will agree that this section would have been greatly improved if the words had been "on the report of Surveyor or Inspector of Nuisances," nevertheless, much may be done by the Sanitary Inspector, but where any difficulty arises the Inspector should refer the matter to the Surveyor for his report thereon.

Workshops.—The powers of entry and inspection of workshops are much greater than in the case of factories, which can only be entered under the 102nd Section of the Public Health Act, 1875.

The 3rd Section of the Factory and Workshop Act, 1891, confers upon local sanitary authorities and their officers equal powers of entry, inspection, and taking legal proceedings or otherwise, to those conferred upon H.M. Inspectors of Factories.

The duties in respect to workshops are also more numerous: cleansing, overcrowding, ventilation, and all other sanitary matters must be attended to by the officers of the sanitary authority, and all these matters must, with the exception of cleansing, be carried out under the Public Health Acts, blessed as they are with all their cumbrous mode of operation, which is far too slow in most cases, and especially so with regard to overcrowding, a nuisance that has to be dealt with, if dealt with honestly, in a manner that is far from efficient.

The 1st Section of the Factory and Workshop Act, 1895, provides that a minimum of 250 cubic feet of air space shall be allowed to each person employed in any room in a workshop during the ordinary period of employment, and 400 cubic feet during any period of overtime; and that the occupier must keep affixed in the workshop a notice, in the prescribed form, stating the number of cubic feet of air space, and the number of persons that may be employed at one time in each room thereof.

Section 4 of the Factory and Workshop Act, 1891, gives power to the sanitary authority to enforce cleansing of workshops on the certificate of a Medical Officer of Health or Inspector of Nuisances, that the cleansing is necessary for the health of the persons employed therein.

Bakehouses.—All bakehouses in which mechanical power is not used in aid of the process are workshops; but there is a distinction between "wholesale" and retail bakehouses which should be clearly noted.

There does not appear to be a definition of a "wholesale bakehouse," but the Factory and Workshop Act, 1883, defines a "retail bakehouse" as any bakehouse or place where the bread, biscuits, or confectionery baked therein are not sold wholesale, but by retail in some shop or place occupied together with such bakehouse, but does not include factory bakehouses; therefore, one would infer that any bakehouse from which any part of the goods baked therein are sold wholesale should be considered a "wholesale bakehouse."

All bakehouses excepting "retail bakehouses" are for the purposes of the special regulations relating thereto under the control of H.M. Inspectors of Factories; as is also the prevention of any new underground bakehouses.

But these special regulations must be carried out in "retail bakehouses" by local sanitary authorities and may be summarised as follows:—Section 34 of the Factory and Workshop Act, 1878, which relates to cleansing; Section 35 of the same Act, which provides for the proper separation of sleeping apartments from bakehouses; and Section 15 of the Factory and Workshop Act of 1883, as amended by Section 27 of the Act of 1895, which renders it retrospective as well as prospective, enacting (i) no water-closet, earth-closet, privy or ash-pit, shall be within or communicate directly with a bakehouse; (ii) any cistern for supplying water to the bakehouse shall be separate and distinct from any cistern supplying water to a water-closet; (iii) no drain or pipe for carrying off fæcal or sewage matter shall have an opening within a bakehouse.

These are important regulations, and should receive due attention; and such abominations as privies so situated that the excreta, at the time of collection, has to be carried through a bakehouse, water-closets opening directly therefrom, or, as I have seen, some actually situated inside bakehouses, and drain openings, and slop-sink waste pipes connected to soil drains should not be tolerated.

New and unregistered workshops in which protected persons, *i.e.*, females, and persons under eighteen years of age, are found to be employed, should, under the provisions of Section 3 of the Factory and Workshop Act, 1891, be notified to H.M. Inspector of Factories for the district. The object of this section is obviously to assist H. M. Inspectors in gaining a proper control over the employment of such persons.

Under Section 26 of the Act of 1891 H.M. Inspectors of Factories must send all notices of the beginning to occupy new workshops to the sanitary authority in whose district the workshops are situated.

On the receipt of such notices the officer of the local authority should visit the premises as soon as possible, in order to ascertain whether all sanitary matters have received proper attention.

Outworkers.—An order has been issued under Section 27 of the Act of 1891 requiring the occupiers of factories and workshops in the trades of the manufacture of articles of wearing apparel, the manufacture of electro-plate, cabinet and furniture making and upholstery work, and the manufacture of files, to keep lists of persons employed by them in the business of the factory or workshop outside the factory or workshop; and this is extended by Section 42 of the Factory and Workshop Act, 1895, to all places from which any work of making wearing apparel for sale is given out to be done; and these lists must be open to inspection by any officer of the local authority. The inspection of outworkers' premises is an important work.

Fire Escapes.—The fire escape clauses, namely, Section 7 of the Factory and Workshop Act, 1891, and Section 10 of the Act of 1895, make it the duty of sanitary authorities to enforce reasonable means of escape in case of fire from the storeys above the ground floor, in all factories and workshops in which more than forty persons are employed.

From the fact that movable escapes will be seen to by H. M. Inspectors of Factories, it would appear to be the duty of local authorities to see to the provision of suitable permanent means of exit.

I would like to suggest that local authorities should be empowered to make Bye-laws for the provision of suitable means of exit in case of fire from all buildings in which any considerable number of persons are likely to be employed or lodged, such as factories, workshops, warehouses, shops and hotels.

Complaints received from H. M. Inspectors of Factories, under Section 4 of the Factory and Workshop Act, 1878, in lation to sanitary matters, punishable or remediable by the ıblic Health Acts, and under Section 10 of the Factory and 'orkshop Act, 1895, in respect to fire escapes, should receive ımediate attention, for Section 2 of the Factory and Workop Act, 1891, as amended by Section 3 of the Act of 1895, d Section 10 of the Act of 1895, if proceedings are not ken by the local authority for punishing or remedying the ıtter complained of, the Factory Inspector may take such oceedings as the local authority might have taken, and recover expenses from the local authority, providing such expenses not recovered from any other person, and are not incurred any unsuccessful proceedings. By Section 3, Act 1895, the al authority must inform the Inspector, within one month, what action they have taken in respect to such notice.

Section 6 of the Factory and Workshop Act, 1895, which is ended to prevent the making, cleansing, or repairing of ıring apparel by way of trade in any dwelling-house or place upied therewith whilst any inmate of the dwelling-house is 'ering from scarlet fever or small-pox, does not appear to any obligation upon sanitary authorities.

hops.—The intendment of the Shop Hours Acts, 1892 to 5, is to prevent excessive hours of employment of young ons, *i.e.* persons under 18 years of age, in and about shops imiting their hours of employment to 74 per week, including l times.

he carrying out of this Act is a difficult and delicate task, is almost entirely dependent upon the statement solicited the young person himself, who owing to his timidity and of offending his employer, requires extreme care in nination to get at the facts of a case; however, in spite ıch difficulties, the Act, where put in force, has done some in preventing overwork of young persons in shops.

he foregoing is a kind of précis, in general terms, of the s of local sanitary authorities in respect to factories, shops, and shops, and in the same measure that these duties erformed so it may be that the lives of those who have to ır long and hard therein may be brightened, or perhaps hened, but which, judging from the Chief Inspector of ories' Annual Report for last year, have not generally been ently carried out.

e apparent neglect is most probably due to the following s: (i) Health departments have generally their hands too lready to carry out the large amount of extra work that a matic inspection of workshops entails. (ii) The work to iciently done means the appointment of special inspectors. of course cannot be done without increased expenditure,

(iii) Unwillingness, in some cases, of the authority to carry out the work. (iv) In many cases local authorities and their officers do not understand what is required of them, the Factory and Workshop Acts being to them, as to many others, somewhat of a puzzle. (v) *To quote H.M. Inspector, Mr. Hore, in the Factory Report for 1895 (p. 242), "What is far worse these sanitary officers dare not, in many cases, be too energetic where shops, workshops, and factories belong to, or are occupied by, men under whose authority they work and by whom they are appointed."*

I would like to make one or two suggestions which I think would, if embodied in the proposed Act to codify the Factory and Workshop Acts, tend to greater efficiency. (i) Equal facilities should be given to sanitary authorities to deal with cleansing and overcrowding in workshops as are given to the Factory Department to deal with the same in factories; that there should be a legal limit to the height to be measured in calculating the air space in workrooms; and that the notice required by Section 1 of the Factory and Workshop Act, 1895, should be a notice affixed in each room, instead of one notice for several rooms as at present. (ii) It should be made the duty of local health departments to report to the Factory Department any case of scarlet fever or small-pox occurring in any house where wearing apparel is made, cleansed, or repaired, by way of trade. (iii) Sanitary Inspectors should be given additional powers to enter and inspect factories, in order to ascertain if the law relating to public health is carried out therein.

As regards the Shop Hours Act, it should be made to limit a day's work, provide for proper meal times, and be extended to protect all females employed in and about shops.

In conclusion, I would exhort those who are my comrades in the battle against dirt, disease and death, to be unsparing with their energies in this work, and in doing so would endorse the words of Mr. Lakeman, H. M. late Superintendent Inspector of Workshops, in the Factory Report for 1893.

We, as public officials, should always remember that our work is one of education, for it has been well said, that "I never thought of it" expresses a state of mind that kills its thousands.

Our Meat and Milk supply, and the Law relating thereto," *by* G. T. Billing, Sanitary Inspector, Holborn.

(Associate.)

ABSTRACT.

ıe author laid emphasis on the fact that it is of the utmost portance that meat intended for the food of man should be rfectly wholesome.

That it is necessary that an Inspector of meat should have a owledge of, and also know the position of the various lym-atic glands, for in some cases all evidence of the disease, ept such as is confined to these organs, may have been noved.

That it is necessary that all Inspectors (especially of meat), if d results are to be obtained, should co-operate with the dical Officer of Health in all matters relating to the inspec-n and seizure of unsound food.

He also drew attention to our sources of meat supply, and some points that must be taken into consideration when in-cting meat. He also made a few suggestions for the more cient inspection of meat.

He then read extracts from the Report of the Royal Com-sion on Tuberculosis in referene to milk, showing that it is the utmost importance that milk should be pure and free m the germs of disease.

Tuberculosis is most prevalent in cows kept in town cow-ses, and it is due to a great extent to the want of proper nliness, ventilation, drainage, wholesome water supply, &c. nspection should be more efficient, and made at milking and ling time, especially in the morning, for this is the best time detect nuisances likely to be met with in cow-sheds and ries.

Milk cans should not be left at houses in which there are s of infectious diseases.

ll milk should be sterilised, and it would be better if it ld be done before leaving the dairies, for a great number of ple will not take the trouble to do so, notwithstanding the incurred.

le called attention to some of the weak points in the Sale of d and Drugs Act.

CONFERENCE OF PORT SANITARY AUTHORITIES.

The proceedings of the Conference commenced with an address by the President, Mr. **Arthur Holt Barber**, published in the Journal, Vol. XVII., Part III.

"*Sanitation on board Ship*," *by* W. Collingridge, M.A., M.D., Medical Officer of Health, Port of London.

(Fellow.)

ABSTRACT.

It may be conceded that shipowners generally are willing, and even anxious to give their seamen good accommodation on board their vessels. Even as a mere question of economy it is obviously to their interests. To get good work out of a man, he should be well housed and well fed. That the seaman practically never enjoys these advantages is almost entirely due to want of knowledge or carelessness on the part of owners. Where ships are well found and fitted, men are kept in good health and temper, and remain with the vessels as long as possible.

The Law requires only 72 cubic feet per head, which clearly is too small and should be doubled. The man himself with his bunk, clothing, and chest will take up 24 cubic ft. or one-third of total space. There is no reason for this small space. 120 cubic ft. is quite practicable, and was recommended by the Labour Commission.

It is frequently urged that as half the crew are on watch, only half are in the forecastle, and that thus practically the amount is doubled.

The answer to this is: (i.) When half the crew are constantly in forecastle, it is impossible to open up and ventilate freely; (ii.) When the vessel is in harbour, and ventilation most deficient, the *whole crew* live in forecastle at the same time.

The author describes in detail the requirements of a healthy forecastle.

It should never be placed below deck on account of the danger in case of collision, and the difficulty of adequate lighting and ventilation.

Where possible houses on deck should be used. These
easily lighted and admit of free ventilation.

A door on either side made to open in two parts by a hori-
ntal division, will always admit air on the lee side.

Bare iron should always be covered with granulated cork in
ler to prevent condensation, and consequent wetting of
lding and clothing. This is a common cause of rheumatism,
seaman's greatest enemy.

Free lighting is essential and easily provided.

Bunks should be arranged in such a way that they do not
erfere with the admission of light from side ports—well
ay from the sides.

The judicious use of white or light coloured paint and the
elling of scuttles, &c., will materially assist.

Very few forecastles are properly lighted, and yet owners
nplain of seamen being dirty in their habits. Give a man
lean and airy space to live in and he will keep it clean—in a
, dark forecastle he has no encouragement.

ron bunks in tiers of two only are recommended. Not less
n 6 ft. long and 2 ft. 3 in. wide, the lower one being at
t 12 or 15 in. from the floor, so as to admit of cleaning
eunder.

loors should be made of stout, well tongued and grooved
ds, laid in solid cement upon the deck with a proper water-
on the outside. A flooring laid on battens with space
erneath only leads to an accumulation of filth and moisture,
h cannot readily be removed.

Where closets adjoin forecastles they should be separated by
uble bulkhead with felt between the two layers, and should
free independent ventilation.

oves should be of a suitable pattern, the most economical
circular wrought iron, lined throughout with fire-clay.
pattern at present mostly in use is most costly, extrava-
, dangerous, and unhealthy.

ere is no reason why sailors should not have proper
ory accommodation. No other class of men have to eat,
, and wash in one compartment, and that so limited, as the
.

e real reason why forecastles are not properly fitted arises
the fact that there is no proper supervision of the plans of
sel before building.

e Board of Trade is not a *sanitary* authority, and has
nitary officers, and, moreover, has no power in the direc-
of sanitation beyond the very limited provisions of the
hant Shipping Act.

Port Sanitary Authority has ample power, under the

Public Health Act, to deal with questions affecting the health of crews, but unfortunately these powers are only exercised when the construction of the vessel is complete.

The designer does not trouble about sanitation. He knows the number of the crew and leaves space for so many men at so many feet per head.

When the vessel is finished, this space is utilized as well as possible.

Before a vessel is commenced, the plans of the crew's quarters, with means of lighting, ventilation, closets, lavatory, storage of drinking water, should all be submitted to the Sanitary Authority of the Port, who with the advice of their Medical Officer of Health, would consider and approve or otherwise.

It would then only be necessary for Port Sanitary Authorities to draw up simple bye-laws, which would be accepted by *all* Ports.

Seamen would be properly cared for, owners and designers would know exactly what was required, and shipmasters would be saved much trouble and expense.

This involves no new principle, but is simply an extension of the practice now obtaining in the case of plans of all new buildings on shore.

"*Structural Sanitary Arrangements of Ocean Steamers and War Ships*," *by* E. W. DE RUSETT, M.Inst.C.E., M.Inst.N.A., Vice-President of the North-east Coast Institution of Engineers and Shipbuilders.

WHEN invited to contribute this paper, the writer felt the subject had been wisely suggested by the Council, as it affects the well-being and comfort of so large a section of the community, who in these days of hurrying to and fro, whether on business or pleasure, have to cross the mighty waters and encounter ills sufficiently in evidence while in their unstable home, without their discomfort being added to by any preventible causes. And besides, should the floating town become unwholesome from any cause, there is no possibility of their fleeing to another township until terra firma is once again reached.

In dealing with the subject the author has been compelled to limit himself to but little more than an outline sketch,

;hout descending into details, which probably would have ved no useful purpose at such an occasion as this. He :refore proposes to deal briefly with the following items, ich he trusts will elicit your kindly discussion:

Sanitary Water Services;
Closets and Latrines;
Baths and Lavatories;
Ventilation.

Iames of patentees will be studiously avoided, so that none . feel aggrieved when all names are omitted.

SANITARY WATER SERVICES.

n a well-appointed ocean passenger steamer three separate er services are provided for sanitary purposes, exclusive of provision for washing decks, bilge, ballast or fire purposes, These consist of *cold* salt water, *hot* salt water, and *cold* h water, with a partial *hot* fresh-water service. The *cold* -water service is primarily for general sanitary purposes, ing, &c.; *hot* salt water for bathing and other kindred ; *cold* fresh water for drinking, cooking, pantries and lava- use, and sometimes a few baths also similarly provided, ldition to salt water; *hot* fresh water to pantries, barber's and surgery, and to special lavatories.

he water for these three services is in constant supply, g pumped up by steam pumps in the engine-room into ice tanks situated at a sufficient height for supply by itation. From these tanks it is distributed by galvanized main pipes, with branches as required, the fresh water ng through filters.

e salt water sanitary services need much careful planning nsure a constant flow in ample quantity, without undue ure, and free from loose air, or the closet valves will ter and splutter. To obtain this, one or more pumps— d sanitary pumps—are fitted on the main engines. These directly from the sea, and do duty when the vessel is r weigh. An auxiliary pump is also provided to assist the ary pumps when necessary. This also serves while the l is in port.

e water is pumped up to a strong galvanised iron tank d at some conveniently elevated part of the vessel; firstly, he supply of the higher class passengers. From the top is an over-flow pipe is led to a similar tank or tanks for upply of the inferior closets, &c., at the ends of the l. Water is delivered into the subsidiary tanks under are, and any air accumulating is discharged from the upper part of the main tank by a suitably arranged self-acting air valve; or a high stand pipe, with open end, is used for this purpose. Pipes from the bottom of the higher of these tanks take the water to the various w.c.'s, lavatories, &c. The waste water from the auxiliary tank is usually led into the crews' and steerage latrines, and the end of the pipe is of course left quite open to avoid bursting the tanks.

When at sea, the supply for the *hot sea-water service* is pumped from the hot water discharge pipe leading from the surface condenser of the main engines—consequently it costs nothing to heat when under weigh. When in port, the water is heated, say, by a steam coil placed in the service tank.

In arranging a *hot-water service*, care must be taken to ensure circulation, or the hot water will cool in the pipes, and failure result. This is a much better and more economical system than heating by steam, as the water costs nothing to heat, is quite free from grease, and no waste of water from the boilers takes place—a matter of much importance in these days of high-pressure steam. In some vessels the water is heated by a kind of steam geyser, one of which is supplied to each bath, this requires a steam and cold water service. The water by this appliance is heated to any required temperature as it flows into the bath. In the author's opinion it is not so convenient as the hot-water system previously described. The *cold fresh water* is pumped from the main fresh-water tanks, situated say in the bottom of the vessel. These are replenished when in port from the usual shore mains, or at sea by fresh water distilling appliances, where the water is obtained preferably by condensing the steam derived from salt water which is boiled in a steam-heated boiler. Water so produced and aerated, is both pure and drinkable.

Special care needs to be exercised in so arranging and fitting these pipes that they may be at all times readily accessible for handiness in repairs, and to minimise damage in case of a leaky or burst pipe.

Provision must be made for expansion, and for emptying the pipes when necessary in frosty weather; also for preventing inconvenience to passengers by moisture gathering on and dripping from the surface of the cold pipes. Stop-cocks and valves are provided not only for distribution, but also to keep all under control in the event of failure of tanks or pipes; otherwise our little township would be flooded, and deep and long might be the growls resulting.

In passenger vessels, galvanized wrought iron is used mostly for these pipes, with occasional lead or copper beds for expansion and lead pipes for soil and similar purposes; but in men-of-war d is not allowed on account of weight, only galvanized ought iron lap-welded pipes being used. Lead is also ectionable from its liability to injury by rats, and further, in ne cases, may induce lead poisoning.

Closets and Latrines.

All this accommodation needs to be open and airy, floors tiled cemented; and in high-class work the dividing bulkheads also lined with white glazed tiles, say to a height of from ee to four feet. Bulkheads dividing the w.c.'s should rest stools, leaving an air space between them and the tiled deck, with ample air space above for ventilation, and facility for hing out. Doors should be treated in a like manner, uring privacy, yet avoiding any sense of stuffiness.

n arranging the soil and waste pipes, the pumping action of sea water in the pipes, as the vessel rolls, must be guarded nst, as this not only makes a disagreeable noise, but also tilates the pipes into the closet.

o correct this, the pipes should be ventilated by a smaller l pipe connected to the upper part of the soil pipe, or body loset, and discharged overboard, say under the level of the . This relieves the closet valves of pressure and stops the ing. A non-return stop valve fitted at the outlet of the pipe is also provided, to prevent the sea washing up the s. The valve is of brass, it has a leather face to en the sound as it beats to the rolling of the ship, and is so d in its chest that it may be removed both from the outside inside of the vessel.

hould the closet be of such a character as to need an over- pipe, to prevent it being flooded by an unsound flushing e, this should not be connected to the soil pipe, but say to nearest scupper.

he practice now is to fit closets having porcelain bodies and , made in one piece without any boxed-in seat, similar to e closets, either with or without lever locked valves (as height of closet above the water may determine), while closets very high up have only a water trap, and depend ely on the ventilated soil pipe and storm valve at ship's to prevent blowing. If near the water line, closets with le valves should be fitted, otherwise the sea may wash up flood it in a sea way. In the double valve type of closet valve is always closed before the other is opened.

n war vessels strongly made closets with metal bodies and d valves are used in the superior officers' quarters. They rally have a storm valve at ship's side. The fittings and arrangements are similar to those already described, the pipes being, as before mentioned, of galvanized wrought iron to save weight. As a rule they are flushed from a small tank overhead, which is filled daily from the wash deck service, as elaborate services of pipes and tanks, such as obtain in passenger steamers, would be liable to injury from shot and might cause confusion.

For emigrants and crews' use, both in merchant steamers and war vessels, latrines placed in a fore and aft direction are generally used. A latrine consists of a trough, say of galvanized iron, having a U-shaped section sloping down towards an exit pipe at the centre of its length. It has a plain wood seat, sometimes divided by galvanized sheet iron screens, placed about two feet apart and two feet high above the seat.

The flush water service is usually on all day, it being the overflow from the sanitary tank, and though constant in action has a good force.

In war vessels a good arrangement is adopted for retaining about 8″ of water in the trough. This is accomplished by means of a hollow metal plug which fits watertight into the exit pipe. The top of the plug is closed at the end by a long rod, which by means of a lever under the deck overhead, lifts the plug by hand when required. Numerous small holes are bored through the upper part of the plug, while an inverted bonnet fitting over them forms a syphon hood. This allows the surplus water to escape down the exit pipe, and yet prevents in a large measure any offensive smell arising.

In this type of closet doors are dispensed with, screens being fitted for privacy. Free ventilation is thus secured in any weather, by the help of the sidelights and other openings.

Besides water-closets, earth-closets are also used in short-passage steamers, but the author has not met with them in any ocean-going vessels.

BATHS.

This very important item in the sanitary equipment of a vessel, especially in warm climates, will next engage our attention.

The bath-rooms should be light, airy, and cleanly, not only in reality but in appearance also (as in the closets), with lightly tiled floor, and, if means permit, walls also covered with white glazed tiles to a height of some three or four feet. These precautions, with a plentiful flow of air without draft, makes a satisfactory and enticing bath-room.

The baths themselves are frequently made out of one solid k of Italian marble; these leave nothing to be desired, ecially when placed with space all round them. Others are le of polished marble slabs cemented and bolted together; fireclay or enamelled iron baths are used.

ombined with the hot and cold water service, shower, y, and douche, and in some vessels even needle baths are ed, and instead of heating the water by steam jet, an mited supply of clean hot water may be turned on, as ribed under the head of Sanitary Water Service. Hence an now say "good-bye" to the greasy boiler steam with its dious accompaniment.

war vessels, and also in all well appointed ocean passenger mers, the stewards, seamen, and firemen have their baths, at now, not only those who are served, but also those who e, may have comforts alike according to their need.

LAVATORIES.

first-class passenger steamers the now well-known fold-up lavatory is generally used, primarily on account of its g up but little space and its more attractive appearance. metimes these lavatories are connected to the cold fresh r service, when an unlimited supply of water is obtained, usual small reservoir being dispensed with. In other a measure of water is automatically run into the basin on ing lowered. Waste-water containers are also sometimes nsed with, when the water is at once conducted overboard itable pipes. These departures save labour, but induce of water, and the arrangement of discharge pipes need to refully designed to avoid water stagnating in them, also to nt the water forcing any smell into the cabin when the l rolls. This may be prevented by efficiently ventilating ipes, and providing connections for clearing and flushing out at any time. Neglect in this respect may render a unwholesome. Lavatories are also fitted up in a special ment, for use during the day, with marble slabs and tilt , as in high-class hotels. Hot and cold fresh water is led from service pipes, and the waste is led overboard. es first and second saloon passengers, lavatories are led of a substantial character for emigrants and crew. times tilt or loose basins fitted in a hinged cover, are over their baths. Washing troughs for clothes, and in long-journey vessels a small mechanical washing plant has rovided for this purpose.

tilated rooms, heated by air or steam coils, are provided ying and airing the linen, bedding, &c.

VENTILATION.

This is of the utmost importance in ocean passenger steamers, and perhaps more so in war vessels, on account of the latter being subdivided into smaller water-tight compartments.

In ocean steamers, ventilation may be performed by a variety of means, preferably by exhausting the air (naturally or mechanically), when fresh air will flow in to fill up the void from the many openings necessary for working the vessel. Mechanical means are doubtless more reliable than natural, as they may be more easily regulated, being independent of the speed of the vessel or velocity of the wind; but this system is not always necessary, especially in large passenger vessels, where the ventilators, skylights and sidelights are well above the water and may consequently be kept open in most weathers.

To ensure successful ventilation, it is advisable to deal as locally as possible with the causes of smells, and so avoid their dispersion over the ship. Consequently, we will first deal with store rooms, galleys, pantries, closets, lavatories and such like places, preferably by *exhaustion*; say by high trunked skylights, by upcast ventilators, with air nozzles producing an induced draft, or by steam or electrically driven fans, resorting to the side-lights, cowl-headed ventilators, staircases, &c., &c., for supplying the necessary *inlets* for air to the saloons and cabins, and from thence to the before mentioned spaces. Passages, dividing cabins, &c., should be as straight as possible, to avoid breaking up the currents which should be allowed to flow freely fore and aft, also from side to side; otherwise the ventilation of the lee side of the vessel will suffer.

For the more effective circulation of air, cabin bulkheads, where not exposed to the sea, should have gratings or jealousies at the bottom, also fanlights, and gratings overhead between the beams; and for hot climates, vertical jealousied panels will be found useful. Pivoted sidelights are very valuable, as they scoop the air into, or direct it out of, the cabin at will, when the vessel is in motion. Ventilating sidelights with floats are also very valuable, admitting air in all weathers.

As a special luxury provision has been made in some steamers for cooling the air entering the saloons, by passing it over refrigerated surfaces, the air being also warmed in a similar manner by the agency of steam—such adjuncts being doubtless much appreciated by invalids.

It is a good plan to fit the closets and baths, &c., in a tiled out airy space, backing against the engine and boiler hatch casing, but it is more customary to fit them next the ship's side, on account of the length of the soil pipes, which are much shorter and have a greater slope than if placed in the former position. However, on the part of the ventilation the former plan has the advantage, as directly over the space is contrived a light and air casing, extending well above the highest deck, having skylight flaps, &c., which can be left open in any weather. Consequently, the air flows from the passages and sidelights, &c., *towards* the closets, and so up the air shaft. The soil pipes being long and comparatively flat, need clearing plugs in case of their getting choked. This system has, however, the disadvantage of breaking up the direct line of passages and so doubtless somewhat impeding the flow of air currents to other parts of the vessel; but all things are a compromise.

In war vessels mechanical ventilation by steam or electrically driven fans is resorted to, in conjunction with sidelights and cowl-headed pipes. The air is forced along galvanized sheet iron pipes through all the necessary compartments. The pipes through the water-tight bulkheads have a self-acting float valve fitted on each side of the bulkhead, in a cage, to which the air pipes are bolted. The arrangement is such that on any compartment being flooded, the rising water will enter the cage and float the ball, and so close the valve.

With these notes before us, we must be impressed with the fact that in every well designed and well appointed ocean steamer and war vessel, the structural sanitary arrangements are such that Cleanliness, which is next to Godliness, may be the daily portion of all who *now* go down to the sea in ships.

Papers were also read on:

"*The Advantages of Sanitary Inspection of Ships*," by Alderman EVAN FRASER.

"*Port Sanitary Regulations and Preventive Measures*," by THOMAS CLARKE, M.D.

"*Suggested Amendments of Port Sanitary Law*," by R. S. HOLMES.

"*Port Sanitary Administration*," by A. WELLESLEY HARRIS, M.R.C.S., D.P.H., and THOMAS WALTON, Chairman Health Department, Southampton.

Owing to recent legislation having in a great measure relieved the difficulties pointed out in the last two papers, the Committee thought it undesirable to insert them

CONFERENCE OF LADIES ON DOMESTIC HYGIENE.

THE proceedings of the Conference commenced with an address by The President, THE MAYORESS OF NEWCASTLE-UPON-TYNE (Mrs. ALBERT LORD), published in Part III., Vol. XVII.

"*Aspects of Cycling for Ladies,*" *by* E. B. TURNER, F.R.C.S.

NOTE.

THE author said that the general average standard of health among the women who cycle had undergone an appreciable elevation since they commenced to ride. The symptoms of "under health" manifested by the modern-day woman of the upper classes was slight indigestion, ennui, lassitude, "vapours," the cause of all of which was want of sufficient exercise. But the cult of the cycle had changed all this. The rapid locomotion was adapted for the weak, as the bodily weight had not to be carried on the feet, but was rolled on wheels. It called into play nearly every muscle of the body, levied a sufficient tax on the heart and lungs, stimulated the action of those organs essential to life which lie within the abdominal cavity, and at the same time produced a healthy and beneficial action of the skin. Nevertheless there were grave dangers to be avoided. No excess should be committed. Every woman rider should gradually train herself by daily increasing distances, and should never allow herself to become fatigued. If, on returning from a ride, she found she could not eat, and could not sleep, she might be sure she had overtaxed her strength, and was converting what should be a pleasant and healthful recreation into a burdensome toil.

"*Hygiene in Relation to the Physical Development of Women,*" *by* Miss G. ROCLIFFE.

ABSTRACT.

THE authoress quoted a number of instances of savage or semi-civilized races in which the woman is equal or even superior to the man in physical development, and contends that the common opinion that women amongst savage tribes in general are treated with harshness, and regarded as slaves, is erroneous, and indeed illogical, considering the survival of the human race. From these instances it is shown that woman can and does, in the simple and primitive stages of existence, develope and maintain a physique equal in strength, service, and beauty, to that of man; whilst, on the other hand, we know from personal observation and experience that under more elaborated conditions of life, such as those under which we are at present existing, she has fallen much below what may apparently be regarded as the normal standard, and has become physically much the inferior of man. This physical deterioration of that half of the race which is to furnish the mothers of forthcoming generations is surely a matter of sufficiently grave importance to lead us to look into the causes.

The progress of the human race is based on the natural law of the survival of the fittest, and among primitive races without contrivance to mitigate natural austerities this law would reign with regard to physical fitness.

With civilization the resources of science enable these natural austerities to be tempered and physical fitness no longer reigns supreme. As civilization advances physical development becomes more hampered by the crowding of people into cities in place of nomadic life; clothing and dress become more restrictive of free movement, and the division of labour tells against the physical development of the woman. Among savages the man's occupation is fighting, and the woman's industrial; as they settle, men take up the out-door labour and the paths of development of the man and the woman begin to diverge. In the present day, in the training of the young much more attention is usually given to the physical development of boys than of girls, and it is imperative that it should be more generally recognized and taught that in the physical fitness of women, as much if not more than the men, lies a nation's chief hope; physical exercise in girls must be encouraged, and they should be prepared for steady work, both mental and physical; they must neither be butterflies nor drudges. They must realize that they have responsibilities, both to themselves and to others, and that the greatest of these responsibilities is to make the best of themselves in every possible way, and so fit themselves to take up some useful work in life, which shall be both a pleasure to themselves, and of profit to the country, remembering in all seriousness that the only justification of existence is service; and then, and then only, may we expect our women to become noble mothers of a noble race.

"*Swedish Gymnastics in England,*" *by* Miss **Ruth Raeburn.**

NOTE.

The authoress gave a short account of the introduction of the system into his native land by its founder, Peter Henry Ling, a Swede. The movements were classified under a methodical arrangement, divided into four branches—educational, medical, military, and æsthetic. The educational and military are so much alike that in England they are generally taken as one; although satisfactory results may be obtained by free exercises, yet, for variety and recreation, it is always desirable to introduce apparatus into a class where possible.

"*The Value of Teaching Hygiene and Sick Nursing to Working Women,*" *by* Miss **J. S. Davis.**

ABSTRACT.

The writer deals with the three questions of *Air*, *Cleanliness*, and *Food* in connection with Domestic Hygiene, and urges the importance of giving instruction in these subjects to working women by such simple and effective measures as the following: By placing a board in the framework of an open window to prevent draught and ensure an upward passage of fresh air into the room to be ventilated; by the taking of a daily bath to ensure personal cleanliness, since the most injurious dirt is formed by the excretions of the skin itself; by the immediate removal of soiled linen from a sleeping room; by administering suitable food to patients in illness, and to children and adults in health.

Instruction in these matters should be given by demonstrations on sick-cookery, and by the distribution of simply-worded leaflets, and magic lantern slides and large diagrams would be found helpful. Ladies might help in carrying out this instruction by becoming members of local committees formed for the purpose, or by giving homely talks at mothers' meetings and girls' clubs.

Some Points of consideration in the Hygiene of Children," by Mrs. Mather.

ABSTRACT.

HE authoress first drew attention to the high rate of mortality
infancy due to improper feeding, want of care in providing
esh air of an equable and healthy temperature, and to the
most total absence of sunlight, in which effort was often made
rear infant life. Proper food must contain the elements out
which the new tissue of the growing body is to be formed,
d by which a constant temperature of about 98° must be
intained. There are the nitrogenous elements which main-
n existing structure and promote the growth of new tissue,
e hydrocarbons or fatty food which serve for fuel to be burnt
in the system to generate heat and force, and the carbo-
drates, or sugars or starches, which are also largely concerned
the formation of fat, the mineral elements necessary to
formation of bone, and water which is essential to the
ire system.

The most important physiological difference to be noted
ween the infant and the adult in the selection of the kind of
d is the absence in the latter of the diastatic ferment, that
he absence in the infant of the power of chemically con-
ting starch into sugar, which is done by an adult principally
he mouth by the aid of the saliva and further by the acid
he pancreatic juice in the abdomen. In infancy the starch-
sting power is absent from both the saliva and the pan-
tic juice. It stands to reason then that an infant cannot
st starch at all and a young child only a small portion.

he only food which nature provides which fulfils all necessary
uirements for the infant is the mother's milk. It contains
he necessary elements in the right proportions, the starch is
dy converted into sugar, and it presents no hard masses.
refore, if cows' milk must be used in place of the mother's
ch should never be done except under the strictest necessity)
ust be made to approximate to the parent's, as much as is
ble, and no other food should be supplied till the cutting of
teeth commences, when it must be introduced gradually in
l proportions, and then not continued too long as an exclu-
diet, but gradually give place to additions of other flesh-
ing and bone-forming foods which the system is as gradually
loping power to digest.

her feeding of infants sets up irritation of the alimentary
caused by the passage of non-digested food, which often
ts in convulsions and other spasmodic affections, chronic
epsia, catarrh of the bowels, &c.

The care of the teeth, the need of their cleanliness and proper use should be carefully taught to the growing child, and supervision of the mouth should be given by the medical man after illness, and in health at intervals by the dentist, as so much of the health of the adult depends upon this preventive measure in childhood.

"*Our Houses*," *by* Councillor Manson, L.R.C.P., M.R.C.S.

NOTE.

The author stated that in his opinion the systematic teaching of Hygiene in schools as a compulsory subject would be the proper method of giving sanitary knowledge to the people at large. He spoke of the need of care in noticing the nature of the subsoil over which a house is built, because of its close connection with many preventible diseases; and also of the unhygienic mode of surrounding a house closely with trees, or building it in a *cul-de-sac* where it could not get free circulation of air or sunlight.

"*The Disposal of Household Refuse, and the Improper use of Ashpits*," *by* Miss de Sumichrast Roussey.

ABSTRACT.

The authoress compares unfavourably the sanitation of Sunderland with that of Edinburgh, and points out the dangers to health that accrue from throwing all the refuse of a house into the ashbin. After remaining there some weeks in close proximity to the dwellings, by night the whole quantity is raked out and carted away, thus liberating the dormant germs of disease. This refuse is then sent by trains and sold as manure.

It is urged that the only remedy for the matter is to abolish the ashpits, substitute covered boxes which are to contain nothing but dry ashes, and the whole of the vegetable refuse of the house to be burned daily. And considering the matter one of such great importance, the question is asked, could not the children of the Board Schools be taught, as part of every cooking lesson, that all vegetable refuse must be burned at once in order to remove one source of danger from the household?

"*On the Teaching and Practice of Hygiene in Schools of the Upper Middle Classes,*" *by* Mrs. WHITE WALLIS.

ABSTRACT.

THAT the nation is in need of more knowledge of both domestic hygiene and of school hygiene being allowed, it becomes a matter of consideration whether this knowledge will be most readily acquired and turned to practical account by introducing it through the lower or through the upper middle-class schools.

The greater numbers will be reached through the machinery of the School Board, but the lower orders lack the intelligence which is to be found in the higher classes of children, to supply and reproduce their knowledge in those circumstances of life for which it was intended to be useful. Also reform works more surely from above downward. Hygiene, too, like all other sciences, must hold a recognized position if it is ever to become an object of desire to the lower classes.

The recommendation of Hygienic Inspection of Schools, argued in the Report of the Royal Commission on Secondary Education, 1895, on the ground that the education of children may be looked upon as a national industry, is excellent, or would be a little later on, but at present there is no school hygiene to inspect. The practice of school hygiene must come first, and this will be best established by the introduction of trained Hygienists or Sanitarians into every high-class school.

It is a post that could be well filled by women of higher education, who would find one year's special training adequate for their work. The Hygienist need not necessarily be an additional teacher on the staff of any but very large schools, as the elementary stages of chemistry, physics, and physiology form a valuable basis of Sanitary Hygiene, and the physical exercises of swimming, games, and gymnastic drill would afford some of the best object lessons on the subject.

"*Teaching of Housewifery in Elementary Schools,*" *by* MISS DUPRÉ.

ABSTRACT.

THE authoress, while commending the practice of teaching laundry work and cookery to board school children, complains that

the teaching loses much of its educative and practical value, by not being *real* work, that is work which is prepared for, carried out and completed by the children themselves, work which they have first felt the need of, then the activity of doing, finally the gratification of having accomplished, and seen to be of use.

The children come to their cookery lesson finding stoves ready, flues cleaned, fires lighted, and saucepans neat, thus they miss the appreciation of the dignity of the lower labour and are learning "finish" before "thoroughness"; again, in the laundry all is prepared and they learn to wash one or two odd garments, but have not gained an idea of how to undertake a real wash.

Such training in Housewifery would include such knowledge as cleaning and ventilating rooms, sanitation, preparation of simple remedies for nursing. Setting tables and waiting upon real dinner would of course require a house and some stated period of residence, but the boon to the rising generation of the working classes, and the restoration of the almost extinct class of domestic servants, who would be proud of their capability, would fully compensate for the difficulties which would have to be encountered in realising such a scheme.

SOLUTIONS PASSED AT THE CONGRESS ELD AT NEWCASTLE-UPON-TYNE, 1896.

ING the Congress resolutions were passed at the various tings, and were in due course submitted to the Council he Institute. After careful consideration certain decisions come to by the Council, which are set out below following Resolution.

s the various meetings at which the Resolutions were passed ot now be informed of the action taken, the Council ght it well to set them out here for the information of interested.

OLUTIONS PASSED IN SECTION 1.—SANITARY SCIENCE AND PREVENTIVE MEDICINE:—

hat this Section of the Congress of the Sanitary Institute is of n that the Boards of Guardians have proved themselves to be ly inefficient bodies to be entrusted with the administration of accination Acts, and recommends the Council to commend to tention of the Government the advisability of entrusting the istration of these Acts to some other authority."

olution of the Council of the Institute.—"That the folg be forwarded to the Local Government Board:—

hat the Council of The Sanitary Institute is of opinion Boards of Guardians have proved themselves to be entirely ient bodies to be entrusted with the administration of the nation Acts, and commend to the consideration of the rnment the advisability of entrusting the administration se Acts to some other Authority.'"

at this Section recommends to the Council of the Institute:—

That some system of notification of human tuberculosis, at te when accompanied by a discharge, is desirable.

That sanitary authorities should urge the Management Com- of Hospitals, Workhouses, Schools, Asylums, &c., in their to give preference to farmers who will supply milk from herds teed free from tuberculosis by the tuberculin test.

That sanitary authorities should advertise from time to time in local newspapers lists of farmers who supply milk from herds guaranteed free from tuberculosis by the tuberculin test, in order that private consumers may know where to obtain such milk.

"4. That the Government be urged: firstly, to supply the tuberculin test free of charge to all farmers who agree to get rid of the animals shown by the test to be affected, and to only add to their herds in future such animals as stand the test; and, secondly, to insist on the marking of all animals which, when tested, show the re-action, and to enact that such animals be sold only for slaughter, and be slaughtered only under the supervision of qualified meat inspectors."

"5. That public abattoirs be established in every district, and that the use of them for slaughtering purposes and meat inspection be made compulsory.

"6. That compensation be given to butchers for the carcasses of animals condemned for tuberculosis when these animals have been bought *bonâ fide* as sound, and before slaughter showed no signs of disease or wasting."

Resolution of Council.—"That it would be premature to take action upon these Resolutions relating to Tuberculosis until the Commission had reported."

RESOLUTION PASSED IN THE CONFERENCE OF SANITARY INSPECTORS:—

"That this Meeting of Sanitary Inspectors, held in connection with the Newcastle Congress, recommends the Council of the Sanitary Institute to support the Superannuation Bill promoted by the Sanitary Inspectors' Association."

The Bill has not yet been introduced into Parliament, and no decision has therefore been arrived at by the Council.

THE PURIFICATION OF SEWAGE BY BACTERIA.

By **Samuel Rideal**, D.Sc.Lond., F.I.C.
(Member.)

Read at Sessional Meeting, December 9th, 1896.

HIN the last few years considerable attention has been
to methods for dealing with the sewage problem, which
nt considerable points of difference from those which
hitherto been considered most efficient, and members of
Sanitary Institute had already had an opportunity of
ssing this subject a year ago, when Sir Douglas Galton
d one of these discussions on the lessons to be learnt from
xperimental investigations by the State Board of Health
ssachusetts upon the purification of sewage. It must not
rgotten that although these American experiments have
great stimulus to fresh work, with a view to perfecting
may be called a natural process of dealing with sewage,
he Rivers Pollution Commissioners more than twenty-five
ago came to very important conclusions upon the fil-
n of sewage through soils and artificial filter beds, which
ne at the present time. Even at that date, the chemical
ent of sewage was known to determine little more than
pid deposition of the suspended organic matter, therefore
to be followed by a natural purification of the effluent
atment on land before the purification was sufficiently
ete for the effluent to discharge into a river. As the
problem is the removal of the organic matters in solution,
ld seem that chemical treatment after all plays a very
part in the complete removal of impurities, and most
ts can cite numerous examples illustrating the really
ficant value of the work done by chemical treatment.
s, quoting from Dr. Frankland, in his summary of the
one in the laboratory of the Rivers Pollution Commission:
lasses of processes are to a great extent successful in
ng polluting organic matter in suspension. As might be
d the filtration processes are in this respect the best,
ion ranks next, while chemical processes are somewhat
ficient for the removal of suspended organic matters.

But the getting rid of suspended matters is a simple problem compared with the removal of organic matters in solution. It is here that the different processes experience the most severe trial, and it is on the application of this test that the great superiority of downward intermittent filtration and of irrigation over upward filtration and the chemical methods of treatment, becomes strikingly apparent. Thus, in round numbers it may be said that on the average the processes of downward intermittent filtration and irrigation remove from the soluble constituents of sewage twice as much polluting matter as that got rid of by the processes of chemical treatment and of upward filtration." I have quoted this paragraph at length as it clearly shows the close analogies in the results then obtained between irrigation and intermittent filtration on the one hand and between chemical treatment and upward filtration on the other hand.

At that time irrigation on sewage farms was believed to be capable of affording a "hopeful prospect of a return of the capital invested," and although considerable opposition has almost invariably been met to the creation of a sewage farm, on the ground that it was likely to be injurious to health, experience has shown no sound reasons for such a contention, and combined chemical and land treatment has now become very general. Experience has, however, also shown in most cases that the reason of the adoption of sewage farms in place of intermittent filtration, viz., "of affording a hopeful prospect of a return of the capital invested," is not warranted; but that the initial cost of the necessary land, and the poor return on the crops grown, make it at the present time decidedly advantageous to adopt the alternative of intermittent filtration.

Owing to the fact that upward filtration gives such indifferent results compared to intermittent filtration, little more was heard of it, and it had been almost forgotten that upward filtration was capable of giving similar results to chemical precipitation, until the new bacteriological processes had again drawn attention to the subject. The chemical methods, although somewhat improved during the last twenty years, have been found expensive to work on a large scale, and even now it is true that the "resources of science hold out no hope that the foul matters dissolved in sewage will be precipitated and got rid of by the application of chemicals to the offensive liquid," so that here again the alternative of "upward filtration" seems worth consideration.

Reviewing the opinions of the Royal Commission of twenty-five years ago, it seems strange that chemical precipitation and subsequent land treatment should have almost entirely taken place of the double alternative, viz., upward filtration wed by intermittent downward filtration.

ven in 1870 it was known that upward filtration of London ge through sand and sand and chalk gave some purification, ugh there was no aeration of such a filter, and that the best ts were obtained when the rate of filtration did not exceed allons per cubic yard per twenty-four hours.

e have then in upward filtration a method of partially ying sewage which is independent of the air supply, and h gives the best results when the passage through the filter ow. In Mr. Scott-Moncrieff's cultivation tank we have of these conditions, and with the exception that we now that the action is bacterial rather than mechanical, the ss is practically identical.

e introduction of flints or stones into the cultivation bed des the rate of progress of the fluid through the tank and surfaces on which the organisms concerned in the chemical ges grow, and I think no one who has carefully studied the ts obtained can fail to admit that a purification has been ed which mechanical filtration alone could not possibly nt for.

e dissolution of the suspended solids which also takes place h a cultivation tank is also capable of being explained on r grounds, as not only have we the well-known fact that solids do disappear in cesspools and when buried in land, as een recently insisted upon by Dr. Poore in dealing with sanitation problems, but their destruction had also been d by Mr. Waring in his "strainers," as well as more tly by Mr. Cameron in his "septic tank" at Exeter. It is sary, however, to clearly distinguish between the changes take place in upward filtration, in slow passage or rest of e, or on such strainers as described by Mr. Waring, and subsequently takes place when the effluent is subjected to nfluence of atmospheric oxygen. The first process is one drolysis, in which chemical changes are effected by means anisms or their enzymes without the aid of oxygen, the d is one in which oxidation is effected by organisms in ice of free oxygen.

an example of the former of these changes may be oned the conversion of urea into ammonium carbonate, s urea is the principal constituent containing nitrogen t in the raw sewage, this change is one of fundamental tance.

$$CO\,N_2\,H_4 + OH_2 = CO_2 + 2NH_3.$$

conversion of insoluble albumen into albumoses and peptones is also a well-known example of such change brought about by enzymes in the absence of oxygen in complex nitrogenous substances. With organic compounds containing no nitrogen, the conversion of cellulose and woody tissue, practically insoluble in water, into starch, which is acted upon by hot water, and finally into sugars which are mostly readily soluble in water, is a well-known hydrolytic change. All these changes take place without any oxidation properly so-called, and when carbonic acid is produced during such fermentation, it is formed not from the addition of any atmospheric or free oxygen, but from the oxygen already existing combined in the organic substances or water present.

It necessarily follows from these considerations that if such hydrolysis does take place, an increase in the free ammonia and carbonic acid in the treated sewage will be noticed, and possibly under some conditions more organic nitrogen and organic carbon will appear in the solution; and that, therefore, an analysis of a sewage before and after such treatment, if judged in the ordinary way, would lead to condemnation instead of a favourable opinion. I should like, also, to take this opportunity of pointing out that the albuminoid ammonia found by the ordinary methods of analysis gives a measure of the easily broken up organic nitrogenous compounds present, and that consequently an increase in the amount may in some cases be regarded as a favourable sign, since it points to the resolution of stable nitrogenous compounds into simpler ones.

As I have recently had an opportunity of examining the most recent of these proposals for dealing with the solids present in sewage, on a thoroughly practical scale at Exeter, it will not be out of place if I refer to it at somewhat greater length, especially as I believe no complete account of what are now known as the Exeter experiments has been published.

The construction of the septic tank, into which the sewage flows, preparatory to passing into the filter beds, is shown in the accompanying illustration (Plate I., page 64), and it and the arrangement of the filter beds is due to Mr. Cameron, the City Surveyor. It will be seen that it is essentially a closed underground tank fitted with an inspection chamber in the centre, through which the sewage slowly passes.

The present installation at Belle Isle deals with the whole of the sewage discharged from the St. Leonards Sewer, and may be considered as an experimental plant designed to deal with the total sewage of a population of about 2,000 inhabitants, the average daily volume being about 50,000 gallons, or approximately one-twentieth of the total sewage of the City of Exeter. The purification effected takes place in two stages h may be conveniently considered separately, the term *nt* being given to the product of the septic tank, and *te* to that of the subsequent filter beds.

Changes in the Septic Tank. The present septic tank has orking capacity of 53,800 gallons, and therefore holds oximately a day's supply. In other words the changes ted in the raw sewage, as compared with the tank effluent, lue to the sojourn of the sewage in the tank for the period bout twenty-four hours. This period of septic tank change ever varies with the volume of the sewage passing, so that ute sewage due to rainfall flows through the tank at a ter rate than the average, and during the period of mum flow a correspondingly greater quantity of tank nt passes out of the tank.

e variation in the composition of the raw sewage from to hour and from day to day, owing to the slow rate of through the tank rendering diffusion and sedimentation ble, must necessarily be less marked in the tank effluent, t its composition is of more uniform character than that e raw sewage. The first change therefore to be noted in ction with the work of the septic tank is the smoothing which it has upon the composition of the sewage, this function of the tank is one of very considerable tance in view of the further disposal of the effluent.

e diminution in the rate of flow of the sewage on entering ank also causes a deposition of the heavier suspended les, consisting chiefly of gravel and earth, in the grit ber. Beyond the grit chamber the sewage flows over a rged partition into the main chamber of the tank, from , at the further end, it is drawn off continuously by a ed pipe" placed transversely to the flow six inches below rface.

the total length of the tank is somewhat more than fifty t follows that with an average flow of 50,000 gallons per n and out of the tank, the rate of flow is exceedingly and very favourable to the settlement of the finer les in suspension. A marked clarification of the raw e was therefore reasonably to be expected as a result of sage through the tank.

s claimed however by Mr. Cameron, that more radical es than these obvious ones take place in the tank, ed by the bacteria which are present in the raw e, whose growth is favoured by the absence of light, d the comparative absence of movement. In order to sh this fact, samples of the raw sewage and tank effluent aken for analysis hourly in such a way that they were proportional to the flow, and representative of the general character of the raw sewage and tank effluent. Four average samples of sewage were obtained in this way during the twenty-four hours commencing at 10.20 a.m. on Nov. 3rd. The gaugings showed that 50,936 gallons of sewage entered the tank during the twenty-four hours, and that consequently it took twenty-four hours fifty-five minutes for the contents of the tank to be changed, or at 11.15 a.m. on Nov. 4th, the sewage taken for this experiment made its reappearance as effluent. Similar hourly samples of the effluent proportional to the flow were taken for analysis during the next twenty-four hours.

A comparison of these analyses shows that the septic tank effects not only the smoothing effect in the composition of the effluent already pointed out as probable, but a very marked alteration in the chemical characteristics of its constituents as compared with that of the raw sewage.

That the contents of the tank had been proportionally changed is shown by the fact that the average chlorine content was practically the same in the raw sewage and effluent. In order to more clearly establish the difference between the sewage and the tank effluent, I have calculated the composition of the sewage to a constant chlorine content of 7 parts per 100,000, and the mean result so corrected is as follows:—

	Total Solids.	Oxygen consumed.	Free NH_3	Alb. NH_3	Nitrite.	N as Nitrate.	Total N.	Organic Nitrogen.
Raw Sewage, Nov. 3, 4.	46·8	6·56	3·6	1·40	0·0	0·0	7·4	4·4
Tank Effluent, Nov. 4, 5.	48·6	4·32	4·9	0·64	Trace	0·04	6·24	2·2

From the above results it will be seen that the changes produced by the passage of the sewage through the tank may be summarised as follows:—

(1) A marked increase in the total solids in solution or fine suspension.

(2) A reduction of about 33 per cent. of the organic matter as measured by the oxygen consumed.

(3) An increase of about 33 per cent. in the free ammonia.

(4) A reduction of about 54 per cent. in the organic or albuminoid ammonia, or 50 per cent. in the organic nitrogen.

(5) A slight production of oxidized nitrogen and a disappearance of a small amount of the total nitrogen.

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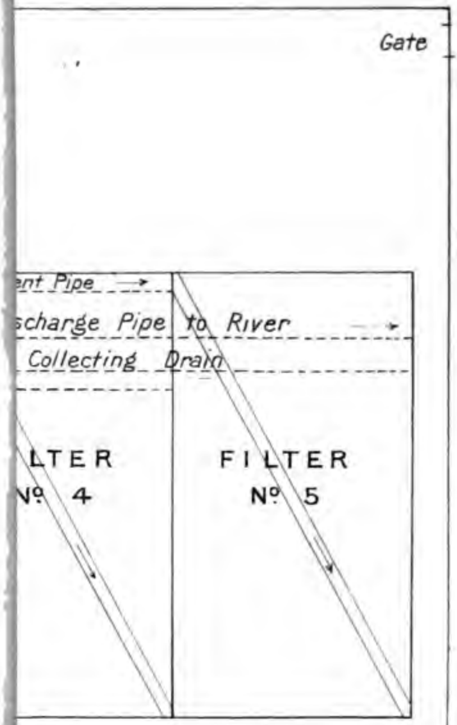

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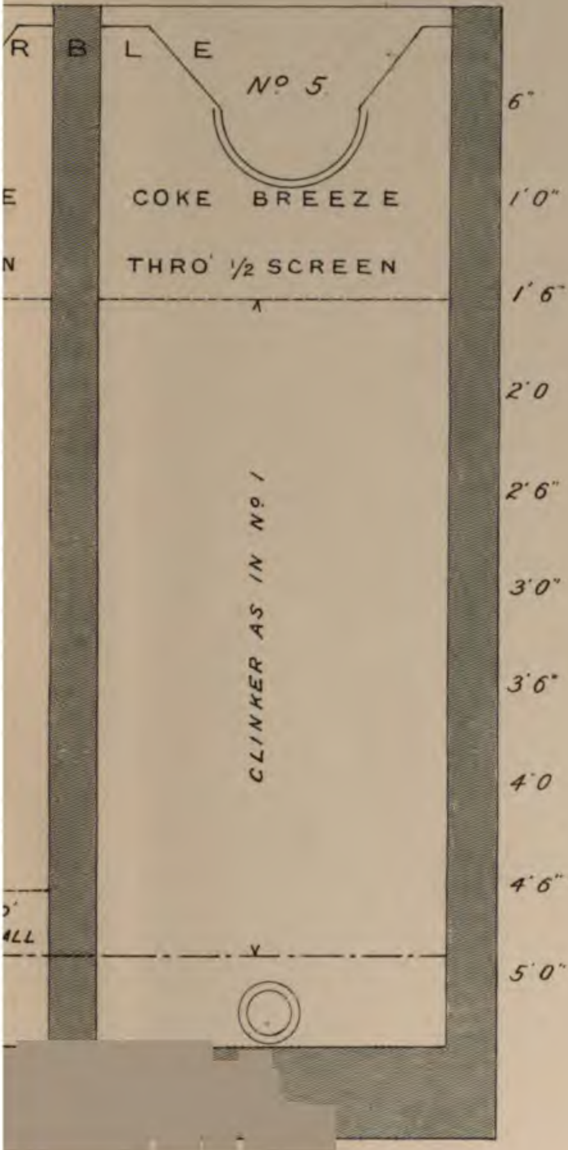

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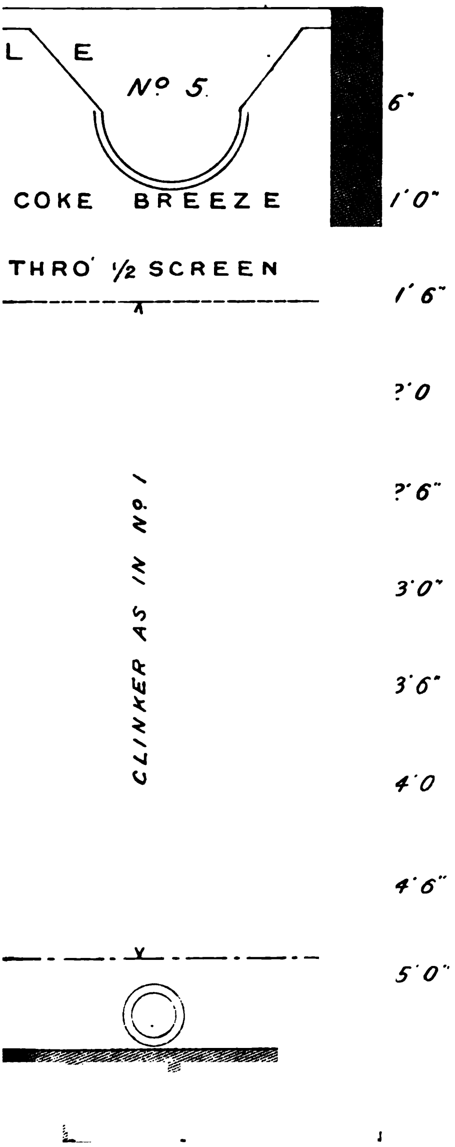
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No. 4.

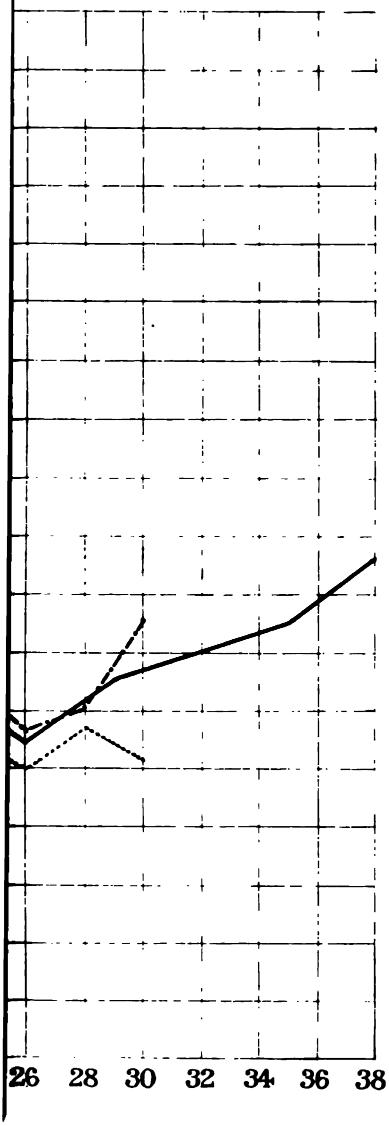
ILTERS.

3.33 p.m.

12 noon.*

12.36 noon.

3.27 p.m.



It is therefore evident that the septic tank by means of its bacteria, enzymes, or spontaneous chemical decomposition, materially alters the composition of the raw sewage. The increase in the total solids points to a solvent action of the water on matter in suspension, and this may be due to a digestive or to a purely physical process, but the marked disappearance of organic matter and transference of the nitrogen from the organic condition to that of free ammonia is undoubtedly due to bacterial influences. The above changes should be capable of being confirmed by (1) Evidence of the production of gaseous carbon compounds, either oxidized as carbonic acid, or as hydrocarbons, and (2) Evidence of the production of nitrogen in a gaseous form, either as free nitrogen, lower oxides of nitrogen, or possibly ammonia which has escaped solution.

The correctness of this was proved by subsequent experiments which established the fact that the dissolved carbonic acid was increased in the effluent, and that carbonic acid gas, nitrogen, marsh gas, and hydrogen existed in the air in the upper part of the tank, which was also found to be entirely deprived of its oxygen.

The raw sewage and the tank effluent were also proved to be devoid of free dissolved oxygen, so that although atmospheric oxygen can leak into the tank, I am of opinion that the amount of direct oxidation in the tank must be very small and that the oxidized compounds produced must be formed from the dissolution or hydrolysis of oxygen containing organic compounds.

Two analyses of the gas obtained (1) from the slotted pipe, and (2) from below the surface of the liquid in the tank are given below; the second sample burnt freely and neither sample contained any oxygen.

	Per cent. by Volume.	
	I.	II.
Carbonic Acid...	0·3	0·6
Methane	20·3	24·4
Hydrogen	18·2	36·4
Nitrogen (by difference)	61·2	38·6
	100·0	100·0

Several determinations of the amount of carbonic acid in the gases of the septic tank showed that from 0·54 to 0·81 per cent. was present, or about fifteen times that in the outside air. As the tank was not constructed in such a way as to allow the gases produced to flow uniformly out of the tank, the absolute amount of gas produced per 50,000 gallons of sewage per twenty-four hours could not be gauged, but it is easy to see that with diffusion taking place, the total loss of carbon and nitrogen per day may be very considerable. A further and more distinct proof of the large amount of organic carbon which disappears in the tank is given by the fact that the dissolved carbonic acid was greater in the tank effluent than in the raw sewage.

Thus the carbonic acid produced in the tank effluent was determined and found to average 8·8 parts of carbonic acid per 100,000, or 12 lbs. of carbon per 50,090 gallons discharged. As on this particular day 62,238 gallons discharged, the above amount of carbon should be increased to about 15 lbs. to represent the loss of carbon on this day.

TABLE *showing Amount of Carbonic Acid formed in Tank.*

In ccs. N/10 Acid per litre.				Amount formed.
No. of Sample.	Sewage.	No. of Sample.	Effluent.	
1	93·0 ?	5	92·0	0·0
2	24·2	6	92·0	67·8
3	38·0	7	94·4	56·4
4	60·0	8	105·6	45·6
			Average	42·45

Amount of Carbonic Acid Gas in the Air of the Septic Tank.

On November 14th samples of gas were aspirated for analysis from about 4 inches above the level of the liquid in the tank.

	Time.	Volume containing equal weights of CO_2.	Percentages of CO_2.
Plug No. 1	11.25 a.m.	1·8	0·54
„ 2	11.50 „	1·2	0·81
„ 3	12.10 p.m.	1·4	0·70
„ 4	12.20 „	1·7	0·57
„ 5	12.30 „	1·3	0·75
Air	11.15 a.m.	24·4	0·04

Average amount of carbonic acid in air of tank = 0·67 °/₀.

The presence of these appreciable quantities of gases containing carbon in the tank and tank effluent undoubtedly proves that considerable purification of the sewage in the tank takes place. Since the date of the above experiments the tank has been made air-tight, and the gases formed have been led off by a pipe and ignited. So that it would be possible for the combustible gases produced to be regularly burnt if a gas holder to regulate the pressure were used.

As the amount of increase in the total solids in the first set of experiments might have been due to the suspended matters in the samples examined—although one would have anticipated more suspended matter in the raw sewage than in the effluent after sedimentation had taken place—a further new series of experiments was started on November 13th, and the samples analysed after filtration. The mean results calculated to a chlorine content of 7 parts per 100,000 are as follows:—

	Total Solids.	Oxygen consumed.	Free NH_3.	Alb. NH_3.	Nitrite.	N as Nitrate.	Total N.	Organic Nitrogen.
Filtered Samples—								
Raw Sewage, Nov. 13,14.	55	3·61	8·5	4·3	Trace	0·02	12·82	5·8
Effluent, Nov. 14, 15 ……	59	2·73	11·2	2·66	Trace	0·022	14·92	5·7

It will be seen that the above results give the same general conclusions as were arrived at from the former series, viz., an increase in the total solids, 25 per cent. of organic matter destroyed, an increase of 33 per cent. in the free ammonia, and a decrease of 38 per cent. in the albuminoid ammonia. The total nitrogen, however, in this series shows a slight increase due to the larger amount of ammonia found in the effluent, or summarising—

	Purification effected by Tank.	
	Oxygen consumed.	Albuminoid ammonia.
1st Series … … … … …	33	54
2nd Series … … … … …	25	38
Mean … … … …	29°/o	46°/o

The Rivers Pollution Commissioners, after an examination of the various processes of chemical precipitation then known, came to the conclusion that the average amount of purification was 28·4 per cent. Org. C. and 36·6 Org. N.

The septic tank seems therefore to effect as much purification as an average chemical precipitation process, or as slow upward filtration. It will be further noted that both sets of experiments show an increase in the total solids in solution of from four to eight per cent., and this can only be explained on the hypothesis that the solid fæces and other matter in suspension pass into solution in the septic tank.

Taking the population as 2,000, the weight per annum of solid fæces may be estimated as 1,300 cwt., containing 2 cwt. of organic nitrogen, whilst 170 cwt. of organic nitrogen will exist in the corresponding urine. These quantities correspond to a daily production of 400 lbs. of solid fæces, containing 5·7 lbs. of nitrogen, together with 46 lbs. of dissolved nitrogen, chiefly in the form of urea, which on 50,000 gallons corresponds to 80 parts of solids per 100,000, containing 1·12 parts of nitrogen per 100,000, associated with 9·2 parts of dissolved nitrogen and 4·6 parts of chlorine per day.

Solid fæces contain 75 per cent. of water, and therefore the possible weight capable of increasing the total solids in solution would be 100 lbs. per day, or 20 parts per 100,000. When it is remembered that at least 15 lbs. of carbon are lost per day, as carbonic acid, or 3 parts per 100,000, or say 6 parts of organic matter dissolved in the effluent, it will be seen that from 10 to 14 of these 20 parts of solids entering the tank in suspension have been accounted for, excluding any estimate of the considerable quantities of marsh gas, hydrogen and nitrogen which are evolved as gas.

The 400 lbs. of solids daily may be estimated as having a volume of ⅓ cubic yard, and consequently, if no allowance be made for any dissolution, the minimum time required for this quantity to fill up the septic tank would be nearly three years. The experience of Mr. Scott-Moncrieff with his cultivation tank and of Mr. Cameron with his experimental septic tank, has been that after long periods of working, the small quantity of residual substance consists of a finely divided inert matter, which seems allied to humus and peat, and is probably similar to the final nitrogenous compound noticed by Adeney in his experiments on sewage, and which seems necessary for the subsequent nitrification process.—(*Adeney, Proc. Roy. Soc. Dub., Sept., 1895.*)

Although the changes in the tank or in upward filtration are necessarily for the most part anaerobic, there is evidence that a small amount of aerobic change takes place. Thus in some cases, nitrates and nitrites in small quantities are found in raw sewage; in the septic tank effluent they are both almost invariably present, and Adeney has shown that from the liest stages of an aerobic fermentation of a strong solution of re urea, nitrous nitrogen is produced in addition to ammoniacal nitrogen. The two changes can therefore go on ıultaneously, and even when entirely under aerobic conditions, first change—viz., conversion of organic nitrogen and carbon ammonia and carbonic acid—precedes the second change, ch consists in the conversion of the ammonia into nitric and ous acids. The small portion of organic matter which is ays converted during the first change into brown humous ies, has considerable stability, and, as Adeney has pointed , seems to be a determining factor for the nitric fermentation mmonia, since in its absence nitrous acid only is obtained.

t is obvious that in a chemically treated sewage, or in a ess such as that of Mr. Waring, this first change must take e on the surface of the filter-bed or sewage farm before ification can set in, and that hence nitrous rather than ic changes are more possible under these conditions than n the initial change has taken place before such treatment. longevity of a filter-bed or the activity of a sewage farm must therefore depend upon the rate at which this initial ıge takes place, and introduces an element of uncertainty their working. The much better results which have been ined by modern filters, as compared with the intermittent s using raw sewage, as originally planned at Merthyr il, can be explained in this way.

ıe conditions for the successful working of a filter bed, so ensure the production of nitric nitrogen when the effluent treated is rich in ammonia and free from undissolved or- matter, are well known, and Mr. Dibdin's London County ıcil experiments with chemically treated effluent have now nfirmed these conclusions, that it cannot be doubted that cially constructed filters will rapidly take the place of the expensive and less uniform sewage farms.

ıe experience gained on sewage farms, and the study of ication by bacteriologists have further shown that in the of land treatment, different soils have very varying ncies. Thus the earlier experiments seemed to show the "cleansing power" of a soil was determined entirely s physical condition, porosity, freedom from clogging, -retaining power, &c.; whereas, at the present time we that the composition of the soil and its bacterial efficiency y the results.

us Dr. Frankland in 1870, in reference to a soil from the e farm at Barking, says, "These highly remarkable s show that there are soils in which the process of nitıtion either does not take place at all, or goes on with great difficulty," and with regard to a loam from Dursley in Gloucestershire he found that it surpassed all others experimented on in its power of purifying sewage, as it had a cleansing power of nearly 100,000 gallons per acre per day. Although at that time the chemical composition of the soil was believed to have no influence on the result, the Dursley soil above referred to contained as much as 8·1 per cent. of carbonate of lime, whereas that at Barking contained under 2 per cent., and we now know that the presence of carbonate of lime or of gypsum is favourable to the growth of the nitrifying organisms.

In a recent inquiry in which alternative sites were available for a sewage farm I obtained the following results :

	A.	B.	C.
Percentage of water	6·75	1·90	3·05
Parts of nitric nitrogen produced per 100,000 parts of soil in 5 days on dilute urine	·168	·504	·36

showing that the least water-logged soil, B., was also the most active bacteriologically. With effluents which have been chemically treated with lime, there is probably sufficient alkaline base to favour the growth of the nitrifying organisms, even when the soil or the filter bed is devoid of such base.

In an analysis of samples of soil from a sewage farm in Surrey, where the soil, a ferruginous sandstone, is very deficient in lime, the calcium carbonate had increased by the treatment of the land with sewage, and thereby the quality of the effluent or purification was increased.

	I. Land before treatment.	II. After 18 months. Field I.	III. After 18 months. Field II.
Moisture	10·96	13·56	14·20
Ash...	8·70	3·68	4·76
Organic matter ...	80·34	82·76	81·04
	100·00	100·00	100·00
Lime	0·224	0·54	1·23
Equal to $CaCO_3$ ...	0·40	0·96	2·20
Organic Nitrogen ...	0·064	0·193	0·230

With filter beds it may be necessary in dealing with sewages of districts supplied with soft water, and in which lime is not employed in the chemical treatment, to add limestone or chalk to the filter bed in order to get the maximum results.

In some filter experiments on the small scale which I have recently carried out, the loss of nitrogen during filtration, and the influence of carbonate of lime in assisting the oxidation of nitrogen, are clearly seen.

A series of experimental filters of about one gallon capacity were fitted respectively with beds of gravel, coke breeze, and sand, each was seeded with 50 grains of garden soil containing 0·01 per cent. of nitric nitrogen. Water containing 10 parts per 100,000 of ammonia in the form of ammonium sulphate, and 10 parts per 100,000 of chlorine as sodium chloride, was passed through with daily intervals of rest. The sand, from the closeness of its particles, showed the least nitrifying effect. Three of the filter beds were mixed with 1 per cent. of chalk, the others had no chalk.

	Date.	Free NH_3	N as *Nitrate.*	Nitrite.
Gravel without Chalk	Oct. 22nd......	7.01	1·28	Distinct.
	„ 27th......	7·5	0·102	Very heavy.
	Nov. 11th......	4·5	0·052	
Gravel with Chalk.	Oct. 22nd......	5·75	2·41	Trace.
	„ 27th......	6·0	2·23	Distinct.
	Nov. 11th......	4·25	4·65	
Coke without Chalk.	Oct. 22nd......	10·0	1·66	Trace.
	„ 27th......	9·0	0·38	High.
	Nov. 11th......	5·0	0·04	Excessive.
Coke with Chalk.	Oct. 22nd......	8·75	1·83	Distinct.
	„ 27th......	7·25	1·51	High.
	Nov. 11th......	5·0	......	Excessive.

These experiments point to the following conclusions:—

1. A rapid and continuous loss of ammonia occurs, which is not accounted for by the amount of nitrate or nitrite formed.

2. The presence of carbonate of lime in the proportion of one per cent. greatly favours the production of nitric, as distinguished from nitrous acid, and therefore a healthy condition of oxidation.

3. That a gravel soil with a sufficient calcareous admixture effects a rapid reduction in the amount of nitrogen present, which seems equal or superior to that of coke breeze.

4. That it is possible for a reversion of already formed nitric nitrogen to nitrite, and possibly to free nitrogen or oxide of

nitrogen to take place in such filters when the conditions are unfavourable.

It is unnecessary for me to refer at length to the very valuable results in filtration which Mr. Dibdin has now obtained after three years' working under varying conditions, as these are now so well known. I should like, however, to draw attention to Mr. Thudichum's resumé of the work done by the County Council in his paper before the Society of Engineers on Monday, December 7th, 1896, in which he has so well advocated the use of such filters as a substitute for sewage farms, that I feel a repetition of his arguments on my part would be unnecessary.

There are, however, a few points in connection with the filter beds in use at Exeter which may not be out of place in this discussion.

The Exeter Filter Beds.—The effluent as drawn from the slotted pipe of the septic tank flows in a thin stream over an "aerator" (Plate I., p. 64) or trough over the edge of which it falls, finely divided, into a receptacle communicating with the filters. At the "aerator" the effluent which emerges free from dissolved oxygen takes up atmospheric oxygen amounting to 0·56 cc. per litre, or about 10 per cent. of the quantity theoretically possible, before passing into the filter beds. This preliminary aeration is, I think, worthy of every consideration, as it obviously is an important aid in supplying the necessary oxygen for the successful working of the filters.

The construction of the filter beds and material used in them do not call for any special remarks, as they have been constructed on well-known lines (Plate III., p. 64) and follow the conditions for successful working which have been established by the Massachusetts Experiments, and more recently in this country by the London County Council under Mr. Dibdin's advice at Barking. In the latter case the removal of 75 per cent. of the oxidisable organic matters in solution in the chemically treated London sewage was effected by filtering 1,000,000 gallons of effluent per day through a coke breeze filter of one acre. 50,000 gallons consequently require 200 cubic yards per day, and this is approximately one-half the filtering volume available at Exeter, excluding a reserve filter bed of about 133 cubic yards capacity.

By means of an automatic gear the effluent is distributed on to the filters in such a way that periods of aeration are ensured. The mechanical arrangements are of such a nature as to work efficiently with varying flows and permit of constant and regular filtration (Plate II., p. 64). This method of working is sufficiently explained in the diagram.

Repeated examinations of the filtrate from the several filter ls have shown that nitrates are produced in appreciable quanti- in the effluent. During the periods of rest, when the filters, ough apparently empty, contain a very considerable fraction the total volume of effluent absorbed in the coke breeze, bonic acid is produced in large amounts (see Table); and s more than probable that it is during the "empty stage" t the greatest amount of nitrification takes place.

TABLE.—*Amount of Carbonic Acid produced in an Empty Filter.*

n November 12th, "compo" tubes were sunk to different ls in Filter No. 2, which had been in constant work for ral days, and the gases aspirated for analysis two or three rs after the last discharge.

	Air.	Tube 1, 18 in.	Tube 2, 36 in.	Tube 3, 54 in.
ent. of Carbonic Acid by lume	0·04	0·375	0·98	0·75
ion to Volume in Air	1	9·4	24·4	18·8

ssuming the air in each empty filter to contain $1^{\circ}/_{\circ}$ arbonic acid, we have 80 gallons of carbonic acid in filter, or about 400 gallons produced per day. The ht of organic carbon destroyed per day in this way is efore about 2½ lbs. No experiments were made to deter- the amount of dissolved carbonic acid produced in the s, but this must be considerable.

e curves given in Plate IV., p. 64, show the variation in mount of nitric nitrogen in the filtrate. After a period of rest, the greatest amount of nitric nitrogen makes its rance in the first runnings, showing that it is during the d of rest that the nitric acid is formed. Analyses of the l rising in the "wells" on filling a filter when the residual l is being displaced, show nitric nitrogen of from three e parts per 100,000 in many instances.

. Sims Woodhead, who has examined the process bacterio- lly, has also formed a similar conclusion from his experi-.

order to arrive at an estimate of the further purification ed by the filters, it is necessary to compare the filtrates produced from raw sewage and tank effluents of known composition, and for this purpose the filter-bed discharges corresponding to the two periods already examined have been averaged and submitted to analysis. The change effected is summarised in the following Table, the filtrates, as in the case of the raw sewages and tank effluents, being calculated on a chlorine content of seven parts per 100,000.

	Total Solids.	Oxygen consumed.	Free N H_3	Alb. N H_3	Nitrite.	N as Nitrate.	Organic Nitrogen.	Total N.
1st Series—								
Raw Sewage ...	46·8	6·56	3·6	1·40	None	None	4·4	7·4
Tank Effluent ...	48·6	4·32	4·9	0·64	Trace	·041	2·2	6·24
Filtrate	42·4	0·78	2·48	0·45	Trace	·30	2·2	4·5
2nd Series—								
Raw Sewage ...	55·0	3·61	8·5	4·3	Trace	·02	5·8	12·82
Tank Effluent ...	59·0	2·73	11·2	2·66	Trace	·022	5·7	14·92
Filtrate	49·9	1·13	6·05	0·87	Heavy	1·06	4·4	10·46

The above results show that the filter beds effect a considerable reduction in the organic matter both as measured by the oxygen consumed and albuminoid ammonia methods, and at the same time further effect the removal of a large percentage of the free ammonia, and the production of abundance of oxidized nitrogen in the form of nitrate.

The percentages of purification effected in the two series calculated on the raw sewage and on the tank effluents are shown in the following table:—

I. Purification due to filters.

Oxygen consumed.	Albuminoid Ammonia.
73 $^{\circ}/_{o}$	60 $^{\circ}/_{o}$

II. Purification due to septic tank and filters.

82 $^{\circ}/_{o}$	77 $^{\circ}/_{o}$

The purification effected by the tank on the raw sewage (see *ante*) being 29 $^{\circ}/_{o}$ and 46 $^{\circ}/_{o}$ respectively. It will be noticed that the purification due to the filters is 73 $^{\circ}/_{o}$, or practically identical with that shown by Mr. Dibdin (75 $^{\circ}/_{o}$), as possible with coke breeze on chemical effluents. The process is therefore almost identical in its results with that of the combined chemical treatment and filter as used at Barking, the septic tank effecting 29 $^{\circ}/_{o}$ purification as against the Rivers Pollution Commissioners' mean result of 28·4 $^{\circ}/_{o}$ removal of organic carbon by all the best known chemical methods, and

› filters yielding $73\,^{\circ}/_{o}$ purification on the tank effluent as npared with $75\,^{\circ}/_{o}$ purification obtained by Mr. Dibdin in the ne way on a chemically treated effluent.

[t will be noted that the filtrates during our experiments still ıtain some free ammonia and albuminoid ammonia higher n that furnished by the London filtrates, or admissible under proposed standard of ·3 organic nitrogen suggested by the 'ers Pollution Commission.

[This is due to the fact that the tank effluent is stronger than chemical effluent dealt with at Barking, so that although percentage purification is the same, the final impurities ıaining are greater.

t is, however, necessary to point out that the filtrate is in ›xceedingly active condition, containing obviously abundance ıitrifying organisms, and also no less than 2·85 cc.s per › of recently dissolved oxygen, or 40 per cent. of the :imum possible, introduced into the filtrate by the method lischarge. The filtrate, therefore, without any further tment, is capable of self-purification, and this change is so d that in less than twenty-four hours the slight odour ced in some of the filtrates entirely disappeared, and the ıtes increased to a much higher figure. In most analyses interval of time between sampling and analysis is very much ter than in these cases, in which the filtrates were analysed ome instances only a few moments after collection. I ›ve that the results herein recorded are therefore more .vourable to the process than if the analyses had been made quickly after collection. Thus, for example, an average ıte on November 14th gave on analysis 0·406 nitric nitrogen l00,000, but when analysed on November 18th the amount increased to 0·882. Similarly a sample collected on Nov. , and analysed on the same day, gave 3·56 nitric nitrogen, ›t on November 18th the amount had risen to 5·045.

ıis self-purification takes place in all filtrates from filter , especially if the filtrates are aerated during the discharge. process is so well known that I need not discuss it at :h, but I should like to insist upon its importance, as Mr. t-Moncrieff, in his nitrifying channels, relies solely on such ange for the final purification of his effluent. This he nplishes by mixing his cultivation bed effluent with river 'ook water to supply further oxygen if necessary, and then 'ing it to pass through an open channel filled with coke. purification of sewage-polluted rivers like the Isar at ich, Zimmat at Zurich, and the Spree at Berlin, have also ıtly been shown to be effected in an analogous manner.

filtrate in what may be regarded as an active bacterial state can certainly be discharged into a river or a water-course without danger, and our present knowledge certainly warrants some modification in the standard of purity of such discharges. The standard of 0·3 parts per 100,000 of organic nitrogen sometimes insisted upon was never legalised, and has seldom been lived up to even on well-managed sewage farms at all seasons of the year, and is not adopted by the Thames Conservancy, which at present may be regarded as the most exacting authority in England.

Adeney in the paper already referred to has suggested a simple standard which conforms to modern requirements, and which might with advantage be adopted by authorities. It is as follows:—"The limit of impurity to be allowed to a given water should be such, that, when a given volume of it is mixed with a given volume of fully aerated water, and the mixture kept in a bottle out of contact with air for a sufficient length of time, a decided oxidation of the ammonia originally present in the mixture into nitrous, or nitric acid shall be indicated."

If some such standard as the above were generally adopted, I believe it would tend to greater uniformity of results, and give a broader basis for judging as to the merits or demerits of any system of sewage purification than we have at present. It would further show that it is possible to produce satisfactory effluents without the use of land, and would permit of the Local Government Board sanctioning schemes which would not only be more economical to execute, but be of a more satisfactory character than many sewage works of the present time, in which the best advice, both with regard to chemical treatment and land irrigation has been followed.

The Chairman (Prof. W. H. Corfield) asked for the thanks of all present for Dr. Rideal's introduction of a subject of such importance. It seemed most interesting that processes should be brought forward which would tend to utilise phenomena already well known in connection with the purification of sewage. It had been long known that sewage stored in a tank would give off marsh gas, nitrogen, &c., but only quite recently had it occurred to any one to turn this to account to liquefy the sludge. In all sewage disposal systems the difficulty was the disposal of the sludge, and any process which would treat this successfully would be quickly taken up and prove of very considerable importance.

Mr. H. A. **Roechling** (Leicester) regarded the septic tank system as the forcing frames or forcing beds of nature in which nature was asked to do its work at express speed; and he would bid them be careful of how they proceeded lest they presently found they had produced a something over which they had no control. It would be well to wait until they knew more about the way in which the work was effected, and the attitude of the Inspectors of the Local Government Board must commend itself to all who desired to see the object of sewage disposal advanced, yet objected to the expenditure of large sums of public money in experimental work. In the septic tanks they first putrefied the sewage and then delivered it into the filters, and to pour sewage after putrefaction had taken place on land had up to now been held to be wrong. Further, the provision of tanks for a one day's flow would prove most expensive, and for a town the size of London simply prohibitive. He would like to know whether Dr. Rideal in the course of his investigation and experiments at the Exeter septic tanks had observed the presence of any ptomaines in the effluent from the tanks, and whether these substances had been diminished by the filters; for if they were still present in the effluent from the filters he should think it very dangerous to discharge it into any brook or stream. Further: did some of the substances formed in the septic tank retard or accelerate the work of the filters? and was sulphuretted hydrogen formed? It seemed to him that the septic tank was simply a machine for the production of sewer gas of a very condensed nature. Turning to the filter beds, he was dismayed at the quantity of albuminoid ammonia present in the effluent, which was considerably above the standard suggested by the Rivers Pollution Commission and the standard now adopted by Sir Henry Roscoe for the Irwell and Mersey Joint Committee. The Berlin Sewage Farms had effected far more than the septic tank and filters, and the effluent from the broad irrigation plots contained, in an average of 71 analyses, only 0·039 parts of albuminoid ammonia in 100,000; while the method suggested could not be very much cheaper than the chemical treatment. According to Robinson and Mellis the cost of the chemical treatment in five English towns ranged from a rate of 1·80d. to a rate of 8·12d. in the £1, whilst the cost of sewage irrigation in twenty-six English towns was on an average equal to a rate of 5·84d. For Berlin the figure was about 0·89d., and for Breslau about ½d., whilst the cost of the Leicester Farm for six years had been equal on an average to a rate of 3¼d. in the £. If they could purify sewage at so cheap a rate they ought to be satisfied. Besides in acquiring land for sewage farms the Corporation were acquiring real estate which would always have some value, whereas tanks and filters, after a treatment had been abandoned, would be worse than useless. So far as he was concerned, while thanking Dr. Rideal for his excellent paper, he felt it would be best to take up the attitude of benevolent observation.

An enquiry was made as to whether the district of Exeter treated, contained any breweries, distilleries, or chemical factories.

Mr. Scott-Moncrieff (London) remarked that when Sir Douglas Galton read his paper, about a year ago, on the experiments of the Massachusetts Board of Health, before the Institute, he (Mr. Moncrieff) ventured to predict that this subject of the purification of effete organic matter by means of micro-organisms would ere long be treated in the light of much greater knowledge than was then generally available. He thought that the able paper which they had just heard quite justified that prediction, and the fact that this was the third which had been read before professional audiences in London within the past ten days was a proof of how greatly the subject had advanced in the estimation of the scientific public. He (Mr. Moncrieff) had carried out investigations on the purifying action of micro-organisms upon sewage on a practical scale in 1891; and in 1892 he showed that they were capable of dealing with the whole of the organic matter without previous deposition or straining. These investigations are set forth in a Report by Dr. Houston, published by Messrs. Waterlow Bros. in 1893, and it is an interesting fact that the original "cultivation" tanks, which were there described, are still at work; and that, as the colonies of bacteria are subjected to a process which entails the survival of the fittest, their capacity for usefulness seems to increase as seeing that they are more efficient now than ever, and carry on their operations quite automatically. It is not to be wondered at that such an inexhaustible supply of natural and beneficent force as is represented by the life processes of these bacteria, should be looked at from the point of view as to how far they can be utilized for the service of man. Referring to the "septic" tank, the arrangement as described by Mr. Cameron had been in use in France and in this country for many years, and he had great doubt if it was equally efficient as an apparatus which provided surfaces for the growth of the organisms. The secondary cultivation tanks used by Mr. Cameron are dependant upon a large extent of well aerated surfaces for their action, and what was good for the organisms of nitrification must be equally good as regards the surfaces for the organisms of liquefaction, even if these were anaerobic in their character. Referring to a statement made by Dr. Rideal in his paper, while it is true that the process which he (Mr. Moncrieff) had advocated depends upon the change which occurs among the unstable organic matters in solution, when they are discharged under favourable conditions as to oxygen, so long ago as 1892 he had clearly indicated the applicability of duplicated or grouped "cultivation tanks" as used by Mr. Cameron, and he had not confined himself to the use of aerating channels alone. In practice, time is an essential element in the successful solution of the problem, and by doubling the activity of the process in any given case, it is obvious that half the tanks, etc., would be sufficient to attain the same standard of purity.

was the better able to congratulate the writer of the paper on ability and ingenuity displayed in it, as he had been at work self on the same subject for several years, and looked upon Rideal somewhat in the light of a pupil.

[r. C. H. **Cooper** (Wimbledon) felt it to be a mistake in alluding ıe upward filters not to credit them with nitrification.

ol. A. S. **Jones** (Finchampstead) would like to see the "Septic Cesspool" system of treating sewage tried as fully as possible, he whole question was complicated, and they knew very little of bacterial action in the breaking up of sewage. The microbe was scavenger of nature, and they ought to watch its proceedings deep interest. They had to purify the sewage, the bacterial n in the septic tank broke the matter up, and a great deal peared in the process: yet as the effluent was disagreeable ling he would not like to have it on a sewage farm. Let them the filter system a fair trial. At present they knew nothing of is to be done with the mineral matter deposited in them, and reliminary expense must be very great. Where they could get cheaply nothing could beat irrigation, but by all means let them with the experiments, moderately, but not rashly.

. G. **Reid** (Staffordshire County Council) said that being nsible for the supervision of a large number of sewage disposal s he was desirous of finding out the actual result which could tained from the septic tank treatment. It appeared to him the results were worse than those obtained by Mr. Dibdin with he tank capacity and filter area. He could show a much better nt, chemically, from an ordinary precipitation tank. With d to the standard of purity adopted he considered that in the f inland towns discharging into comparatively small streams ·05 100,000 of albuminoid ammonia should not be exceeded. rdshire represented many other counties as regards general tions, and taking the figures given them that evening he was pointed with the results obtained by Mr. Cameron's experil tank, and was of opinion that the system, although good from dge disposal point of view, was by no means satisfactory as ls the ultimate result.

G. V. **Poore** (London) said that with regard to the comvely recent dates quoted as to the insistance on biological ses in relation to sewage disposal, it was now about ten years he read a paper before The Sanitary Institute dealing with the iological aspect of the question. Looking at the construction septic tank under notice, one was inclined to say it was lingly ingenious, but he wanted to know something more about lid matters in the sewage, for he could not believe that paper, , rag, feathers, &c., were dissolved. They could not force , truly; what the engineer had hitherto tried to do was to thwart nature. They had heard nothing about the sulphuretted hydrogen evolved. The best effluents were obtained, he observed, when the filter beds were nearly empty: and they knew that in filtration directly a filter got fully charged the power of that filter ceased; the intermittent downward action must be almost constant. The septic tank appeared to him to resemble a fermenting vessel in a brewery. Some of the stuff floated to the top, like the frothy yeast, and some sank to the bottom, and a fluid tolerably free from suspended matter was drawn off between the two. It clearly had one great advantage over other systems inasmuch as no chemicals were added to the sewage to check the growth of those organisms (such as the Beggiatoa) which alone led to its oxidation, &c.

Mr. J. P. Norrington (Surveyor to the Vestry of Lambeth) said that being a native of Exeter he had naturally taken some interest in the subject before the meeting and had seen the septic tank at work. He had visited a great number of works of a similar kind in England, and he desired to testify to the efficiency of the system under discussion, the filtrate showing a degree of clearness and purification seldom seen elsewhere.

Mr. D. Cameron (Exeter) was invited to speak on the subject; and in responding said that the sewage received no preliminary straining: whatever goes along the sewer finds its way into the septic tank. Great difficulty was experienced in obtaining suitable filtering material, and to get the work finished as soon as was possible, he had to take old clinker that had for a long time lain in a market gardener's yard, only one of the filters being of coke breeze. On the 21st of August the works were started. He was desirous of knowing the actual water-capacity of the filters when the filtrate was dry and after being saturated. To do this the filters had to receive their full dose to begin with, instead of being gradually formed by small doses as recommended by Mr. Dibdin. Instead of getting a day's rest each in seven, the shortest time that any filter worked, without intermission, was sixty-one days. The months of September and October were extremely wet, so that instead of dealing with the normal quantities of sewage they had to deal with twice and three and a half times that quantity, or at the rates of 1,300,000 galls. per acre per day, and 1,860,000 galls. per acre per day. And it was after such work and during a period of severe frost that the investigations of Drs. Rideal, Dupré, and Sims Woodhead were made. One of the dominant ideas he had in laying down his system was that it should be subjected to the severest treatment which it was likely to receive in practice—that in fact the works should be left to take care of themselves, and that was what practically was done, and he was not aware of any works that could be so left. During the investigations that were made he was surprised to find storm waters, after a continuation of wet weather, so high in organic pollution. He thought it would be found necessary, instead of making provision for

reception of a certain part of an inch's rainfall for twenty-four
rs, that an extreme case should be taken or that the worst
dition should be provided for, such as a summer thunder shower
r three, four, or five weeks' drought. He had observed more
ruction of fish life in half-an-hour under such conditions than
ld be found in years from the discharge of domestic sewage into
ream. At no time was the assistance of the chemist of greater
ortance to the engineer than in the question of dealing with the
m sewage of a populous district. Filters worked intermittently
not become inefficient by any clogging by solids carried over, but
n overcharged by too frequent doses of effluent their water
city becomes rapidly less and their efficiency almost ceases.
hing is easier of demonstration than that sewage filters are
mere strainers. He had been deeply interested in the discussion
thanked them heartily for the remarks made.

r. S. Rideal (London), in acknowledging the vote of thanks
rded him, said that with regard to the results, it was not his
tice to take a roseate view of things, and therefore his con-
ons were under-estimated rather than otherwise. The Local
rnment Board would not, of course, pass such a scheme for
towns if they still continued to insist upon the purchase of
at a certain fixed rate, dependent upon the population. The
er filters were on the lines of those at Massachusetts and at
ing; and at Exeter they had procured practically the same
ts as Mr. Dibdin. If it be insisted on that the albuminoid
nia represents removable organic matter, it must be remembered
it is in an easily decomposable state, and already associated
much dissolved free oxygen, and active nitrifying organisms.
therefore, in a condition to put on to a very small area of
or into another filter, for further treatment. So far, he had
btained any evidence of the presence of ptomaines, but it will
en that the process involved no new changes, but was under
me conditions as occurred in large irrigation systems, so that
ompounds produced are identical; as the filter beds afford
opportunity for oxidation, it is exceedingly probable that such
ounds, if formed, are destroyed in the filters. With regard
r. Roechling's question, nitrification is retarded by the sub-
s formed in the tank when the effluent is supplied too quickly,
s sewage badly treated chemically would prevent the proper
ncy of work on land. When, however, the right ratio of
nd effluent was maintained, the filters should work con-
sly. Sulphuretted hydrogen is produced in the tank, just
is produced in a sewer; but it was, he felt, far better to
ce it in the closed chamber than on the land, or in a sewer
it might, and often does, create a nuisance. With regard
e argument that a lengthened stay in the filter bed would
ve the filtrate, experience showed this was not so, the reverse
the case. The matter treated was the domestic sewage from

a suburb of Exeter with a population of some 2,000. There were no chemical factories in the range of the sewer, but he failed to see why, if the process could serve in one case, it should not do so in another. Mineral sludge was, of course, not dissolved, but by means of the grit chamber it could be removed at any time; and as the progress of the sewage was so slow in the tank, the mineral matter would to a very large extent fall. The trouble in all processes was not with the mineral matter, which did not putrefy, but the sludge, which did. In the Exeter scheme there was no sludge difficulty, as even if the tank effected *no* solution of the suspended solids, it would still act by sedimentation in a closed space and therefore without offence, and the particles could not reach the filters and so cause clogging. The putrescent liquids are delivered on to the surfaces of the filters and not below, after aeration has been effected by the sewage passing over a weir, as shown. He had already observed that the evolved gases could easily be burnt and rendered inoffensive, and the heat produced might possibly be utilized.

IE SANITARY SUPERVISION OF SHELTERS FOR THE HOMELESS.

y F. J. Waldo, M.A., M.D., D.P.H., Barrister-at-Law,

lical Officer of Health for St. George-the-Martyr, Southwark, and Inner and Middle Temple.

Read at Sessional Meeting, February 10th, 1897.

E term "shelters for the homeless" is a wide one, and must taken to include those provided by the State on the one d, and by private enterprise on the other. The first class, esented by the Poor Law vagrant or casual wards, is suffi- tly well looked after from a sanitary point of view, and l not here be further considered. The second, or voluntary, it shelters, however, stand on an entirely different footing, use they lie practically outside the control of local sanitary orities.

he private night shelters are for the most part devoted to , but some few are set aside for women, and one, at least, boys. Some again are free of cost, and others are available ayment of a small fee.

t the outset it may be well to state the nature of the natives now offered to the homeless folk of this country. t, there is the night in the open—that is to say, in a field, , or in any court, alley, or archway convenient for the ose. This plan costs the tramp nothing; it is tolerable and pleasant in summer, although it often becomes dangerous exposure in the winter; at all times the sleeper is liable isturbance by the police. The casual ward also costs ing, at any rate so far as actual cash is concerned. It ves, however, a considerable indirect payment in the shape tention and hard work. The common lodging-house costs ess than fourpence a night for a bed, and is, on the whole, a bad refuge for the "dosser" who can scrape together additional pence to provide himself with food. Lastly, are the Salvation and other private shelters, which de sitting or sleeping accommodation either free or at a varying from one penny to threepence—or, in some cases, sixpence—for the night; they also make, as a rule, a er charge for food and for other extras.

Of these four alternatives it will be seen that three are available for the penniless, namely, sleeping out in the open, the vagrant ward, and the free shelter. Of the others the pay shelters take their guests at a less price than the common lodging houses, with which they thus come into sharp trade competition.

From a sanitary point of view the chief points in which the pay shelters differ from the common lodging houses are the absence of control by County Councils, and by local sanitary authorities.

The provisions of the Common Lodging Houses Act, which in London are now enforced by the County Council, require, amongst other things, that each house be registered, and be periodically lime-washed. Bye-laws provide specifically for the regulation of the number of lodgers and the separation of the sexes; for the promoting of cleanliness and of ventilation; for giving notice and taking precautions in cases of infectious disease; and for the general well-ordering of the houses. It is needless to describe further in detail the long list of requirements imposed on the lodging house keeper.

The shelters do not come under the provisions of the Common Lodging Houses Act, which grants the regulating authorities a right of entry at all times. They are in a kind of no man's land, and the Medical Officer of Health can deal with them only as he does with private premises generally. For instance, he is entitled to demand admission during the daytime between the hours of 6 a.m. and 9 p.m: that is to say, when the shelter is empty and his visit, therefore, of little value. If he can prove to a magistrate that he has reason to suspect overcrowding or other nuisance of such a nature as to be dangerous to health, then he may obtain an order for entry upon a stated night. Upon the evidence gathered from the visit thus effected the local authorities may, if they think fit, undertake an action for abatement or for prohibition of the nuisance. It is obvious, however, that such a system of control must be slow, cumbrous, inefficient and costly. Under present conditions all the Medical Officer of Health can do when a case of notifiable infectious disease is reported from a shelter is to go to the place and volunteer to disinfect the premises. The shelter officials, however, so far as one can gather, almost invariably prefer their own methods of disinfection. It may be remarked that the difficulties of carrying out the process in a big building are serious. Suppose it be wished, for instance, to fumigate a fairly large hall, say of a capacity of 60,000 cubic feet, with sulphur, the usual allowance of that drug is a pound and a half for every thousand cubic feet; so that such a hall would uire nearly fourteen stone weight of sulphur for its efficient nigation. It would be a matter of interest to know what ount the chief Metropolitan shelters which possess such ge halls have actually spent during the past few years in phur and other disinfectants, and at the same time the cise nature of the materials used. On the other hand, the ging house is under strict supervision: it must be kept in d maintenance and repair: it is liable to be called upon at moment to carry out costly structural alterations: its limit o number of inmates is fixed by rigid rules: and it has to e ample provision for personal washing.

ot one of these summary conditions, however, applies to private shelter, which thus obtains a huge start in the com-tion for the custom of what may be called the "penniless" r. The shelter has no restriction as to numbers: it is not pelled to provide adequate washing and other accommo-on: it defies the control of the local authorities: in a word, ractically follows its own sweet will in all details of adminis-ion.

here was a time when the common lodging houses were censed and unrestricted. The late Lord Shaftesbury, who mainly instrumental in getting the special Act passed for r regulation in 1851, did so on the ground that they were res of immorality, crime and overcrowding, and in these ous ways constituted a standing menace to the public h. So far as concerns overcrowding there seems to be a ral opinion that the night shelter of to-day requires special lation not less than was the case with the common lodging e of former days. As regards typhus fever Dr. William re forcibly remarks that by the Common Lodging Houses in London* "the outbreaks of typhus were rooted up so pletely and at once, that only at rare intervals and never ong, has typhus fever appeared in this part of England." here is no fixed sanitary standard of space allowance, but e case of lodging houses 300 cubic feet is demanded per , and that, be it remembered, always in the presence of ventilation, and double that amount is provided in prisons. aling with space estimates the decision as to what is or is good ventilation must obviously be left in the hands of the ority. A lodging house proprietor is not permitted to use his judgment on these points, and one naturally asks on what nd the shelter keepers claim any such right. In the absence ingent regulations as to cubic space there is a constant temp-n to overcrowd. The greater the number of paying customers in the shelter the larger the profits. It was a similar appeal to the pocket that crowded the common lodging house in the old lawless days until its inmates were like the proverbial herrings in a barrel. A monetary consideration, it is hardly possible to doubt, has some amount of influence upon the shelter of to-day. So far as the safety of the public is concerned it does not matter one straw with what motive the shelter was originally founded. It is a poor excuse for bad management and overcrowding that the profits of a shelter are devoted to a good purpose. The Public Health Act, which is no respecter of persons, may be regarded as marking a humane and enlightened stage of legislation in this country. It aims at the common weal, and in essence may be described as one of the most purely democratic laws ever placed on the statute book. Plainly the gist of modern philanthropic movements is to include the welfare of the body as well as of the soul. Why then, should any attempt be made to avoid the regulation of the sanitary authority as to cubic space and ventilation, both of which closely affect the bodily well-being of the inmates of night shelters? Again, if harm be done to the outside population by carelessness of supervision in the night refuge, the interests of the many will suffer for the benefit of the few. The question arises whether the shelter owners had not better in future consent to leave the care of the bodily environment of their customers to those who are skilled in such technical work as the sanitation of buildings where large numbers of persons are congregated.

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* "Essays in Preventive Medicine," by William Squire, M.D.

Let us take as a particular illustration the case of a night shelter that has come under my notice officially, and of which I am able to speak from actual experience. Elsewhere it has been described as follows:

"The position of this particular shelter has been defined after a series of legal proceedings. The High Court decided that it did not come either under the Common Lodging Houses Act or within the Public Health Act as regards disinfection. The shelter, therefore, is less under the control of the Sanitary Authority than an ordinary dwelling house, inasmuch as disinfection can be enforced in the latter. As to overcrowding, the Sanitary Authority has a right of entry between six in the morning and nine at night, that is to say, when the place is empty. In a word, the shelter is practically outside official sanitary control. These facts have been emphasised by its having been the starting point of two outbreaks of small-pox, and also by the verdict in a police-court prosecution, when 1,031 inmates were proved to have been in a space which the magistrate said would be overcrowded by 551. The conviction for overcrowding was sustained on appeal by the defendants to igher Court. The shelter offers sitting room for one penny night, and rough sleeping accommodation for twopence or eepence. Nominally, its doors are open free of charge to absolutely destitute, but in practice everyone has to pay. e shelter is founded with money subscribed by the outside lic. That it makes a handsome profit out of the pence of poor has never been seriously disputed. At first sight its k appears to relieve the Poor Law and to lessen the burden n the poverty-stricken district in which it lies. Further iry, however, will show that night shelters of this kind act a poor, shiftless, and often disabled class of the com- ity to the poorest districts of London, where they are wn upon the rates, and the ratepayers are consequently lled with the cost of this ill-considered philanthropy."

eturning to the sanitary aspects of the matter. The direct gers of improperly conducted night shelters may be briefly idered under two heads: namely, A. Danger to inmates. Danger to outside public.

. *Danger to inmates.*—This is likely to result from over- rding, especially in the absence of proper ventilation. se who spend the night in a vitiated atmosphere are kened so as to be less resistant to the invasion of disease. her, close and prolonged bodily contact is likely to infect ı with contagious and infectious diseases, such as small-pox itch. The agency of the shelter of which I have spoken in spread of body lice is shown by the returns of the Union .895 which show that out of 630 paupers admitted direct the shelter no less than 136 were infected by such vermin. estimate does not include "casuals," who are not reported . in this particular.

The danger to the outside public lies in the spread of se from the infected night shelter. That small-pox has spread from such a centre has been amply proved in al specific instances,—such as that of the shelter above ed to. So far as one can see there is no reason to doubt what is true of the spread of small-pox with regard to the er is equally true of other infectious diseases, such as et fever and typhus.

further important point should be noted in considering the d of infectious disease from a night shelter. The wan- g habits of the folk who frequent these places of necessity rses a certain number of them every day to seek fresh ers. Hence supposing a shelter to be invaded, say, by -pox, within a short time a number of its infected inmates e scattered through neighbouring shelters. Something of ame kind has been shown over and over again to happen in the case of tramps who carry infection from Union to Union all through the country. If that be the case under careful medical supervision it is obviously more likely to occur in shelters that are absolutely outside and beyond proper sanitary control.

From the foregoing facts it is clear that the night shelters escape the control of the local authorities, and thus we can hardly avoid the further conclusion that as centres of actual and potential disease, they become a danger, first, to their own inmates, and, secondly, to the outside public.

The obvious further conclusion is that all night shelters should be brought under the control of the local authorities, either by a separate legislative Act, or by bringing them within the purview of the existing Common Lodging Houses Act.

Dr. R. Farquharson, M.P. (London), who presided, described the paper as a most interesting one; it was short but terse, and one they could have listened to for a longer time. Dr. Waldo exercised an art all too rare in lecturers in being able to put a lot of information into a very little space. The paper just read was void of packing, but very valuable and one that ought to provoke discussion.

Miss Goddard (of the Shaftesbury Mission) said Dr. Waldo had put forth his case in favour of supervision of Night Shelters very forcibly, yet it must not be forgotten that whilst they were of a philanthropic character, they were primarily opened for the glory of God, and the workers in them, if actuated by proper motives, would take precautions as to health and cleanliness. From personal experience she knew this was so, and further, that records were made of those who sought shelter therein. So far from objecting to the supervision or the inspection by the authorities, she thought they would welcome it.

Mr. R. Adams (St. Luke's) said that the paper was an excellent one; the great question for many years had been how to provide for the people who will not help themselves, and in some measure the workers in the Night Shelters had solved it: he might add that his present Local Authority, St. Luke's, had a new set of By-laws whereby the Inspectors had power of entry at any time for the purpose of preventing over-crowding in "houses let in lodgings," they also had a large number of such houses upon the register. This he considered to be a step in the right direction, but the tug-of-war will come later on when the point is contested, as the London Public Health Act defines the power of entry between 6 a.m. and 9 p.m. (as he was of opinion that a By-law must not exceed the Statute). In Liverpool they had an Act of Parliament so far back as 1851, whereby the Corporation had power to visit houses let in lodgings, and a special staff of men were engaged in the inspection. The great difficulty an Inspector has, even when the supervision is granted, is to prove that danger to health really exists. His own experience was that the poorer the class of people in the Common Lodging House or the shelter the sharper their wit, and directly the Inspector was seen in the neighbourhood, a suspicion that something was wrong would put them on the alert, and where overcrowding has been known the visit to confirm the statement has been useless because a number of the habitués had removed to another house, possibly only across the street, for the time being. Liverpool's Sanitary Act empowers the Lodging House staff to visit houses of the character dealt with by Dr. Waldo at any time, and visits are paid at one, two, or three o'clock in the morning, the officers going through the buildings from top to bottom; and this being done when all the inmates are at home, ensures the number being within the limit prescribed. Every room is scheduled and every facility afforded the Inspector to carry out his duty. How different it is in London where you have first to prove your case and then to trap your bird. In a case under his own notice, complaints were made in reference to overcrowding and generally unhealthy conditions against a Night Shelter; the Sanitary Inspectors were instructed to visit; they did so, but unfortunately they had to make their visit by day-time, which was practically useless; yet they had no power whatever to visit when they should do so, to see things were satisfactory; the result is that from a sanitary standpoint they were to-day in the position they were fifty years ago, so far as supervision is concerned. He suggested a combination of the London Sanitary Authorities with a view to securing a Bill dealing with shelters.

Miss **HOMERSHAM** (London) considered The Sanitary Institute could very properly move in the matter under discussion. They as students of sanitation and hygiene were aware of the amount of space required, but it often happened that promoters and workers in charitable efforts were ignorant of the value of a sufficient space.

Mr. G. A. **ALLAN** (London) felt the requirements of the sanitarian would be met if the last paragraph of the paper was put into force, viz., "That all Night Shelters should be brought within the control of the Local Authorities, either by a separate legislative Act, or by bringing them within the purview of the Common Lodging Houses Act." Newcastle-on-Tyne have full powers to deal with Lodging Houses, and Inspectors go in at any hour they think necessary. They had, on the whole, better control than in London. They had in [illegible] Night Shelters to bear in mind [illegible]

[illegible] some practical [illegible] resolution, pointing [illegible] should be adopted, and [illegible] London County [illegible]. The Free Shelter [illegible] management, of an ever-shifting [illegible] adequately supervising [illegible] overcrowding, [illegible] might obtain [illegible] House, with what [illegible] danger. There are [illegible] Health Act was the [illegible] the character of which [illegible] prevent contagion. A [illegible] knew whence he [illegible] the High Court, [illegible] under either the [illegible] Health Act, for disin[illegible] was done; and in [illegible] space, it would [illegible] definite floor space [illegible] times put forth as [illegible]

[illegible] endeavouring to [illegible] power of enforcing [illegible] course, good [illegible] cleanliness was [illegible]

[illegible] thanks to [illegible] present had [illegible] which needed [illegible] better fitted than [illegible] means of attaining [illegible] Night Shelters [illegible] might then be [illegible] Public Health Amendment Act [illegible] Baths, [illegible] shelters [illegible] and general [illegible] a suburb of [illegible] Act had been brought [illegible] owners [illegible] with very [illegible] increased sanitary accommodation, ventilation and general cleanliness of the buildings.

Mr. A. Mayell (London) concurred in every way with Dr. Waldo. Legislative action should be secured providing for inspection, and regulating the amount of cubic space for the inhabitants of the shelter. Personally he would like to see the shelters swept away. The Common Lodging Houses provided for a class, and if a man had not sufficient to obtain a bed there, then the Casual Ward was his place. Dr. Wynter Blyth in a lecture had said that the shelters were the worst things ever provided for London, and simply induced the aggregation of the worst phase of society.

Other gentlemen having spoken on the philanthropic character of the shelters,

The Chairman summed up: The shelters are here, and from some extraordinary reason were without the pale of ordinary sanitary supervision; personally, he could not see why the Free Shelter should enjoy an immunity from the oversight of the Common Lodging House. They had most of them read of Dr. Waldo's dramatic effort to enforce inspection, but beyond this it was impossible to properly disinfect such buildings, even nominally, and no more ingenious method of spreading infection broadcast over the country could be devised. The shelters are used by tramps, who having slept in one for the night starts off next morning on his peregrinations, possibly carrying disease wherever he went, and probably finding a similar institution in which to pass the night. He hoped very soon this danger might be minimised, by the shelters being brought under the Law. He was very pleased to hear the practical suggestions put forth, and would do his best to give them effect; for notwithstanding the very great difficulty of getting a private Bill through owing to so many desiring to obtain the same end, or the difficulty of getting the Government to introduce a Bill; yet if the pressure of The Sanitary Institute could be brought to bear some good result might be obtained. The discussion had been one of the most interesting he had listened to for a long time, and was eminently practical throughout.

A vote of thanks was unanimously accorded Dr. Waldo for his paper, in acknowledging which he said there were very few points to reply to. So far as the good intentions of the heads of the shelters, and their recognition of oversight, he had had personal experience of this, and it did not agree with the opinion expressed. The suggestion that the shelters should be under the Common Lodging Houses Act was an exceedingly practical one, and resolutions of a similar character had been passed by the Vestry of St. George-the-Martyr, Southwark; the Metropolitan Branch of the Medical Officers of Health Society; the London County Council Conference; and the Public Health Section of the British Medical Association; and he was in hopes that some good might eventually result from the concensus of opinion in the matter. The remarks of Mr. Thompson as to floor space were most important, the regulation of numbers by this method being more valuable than by cubic measurements. In the case of the largest Night Shelter in London he had asked for 30 square feet floor space, and 300 cubic feet air space for each inmate. This was the minimum he regarded as necessary in the presence of free ventilation. So far as bathing or washing, the user of the Casual Ward is compelled to have a bath and his clothes are disinfected, and a proper cubic space is provided, but in the shelters the accommodation was generally very bad. He had very great pleasure in moving that " In the opinion of this meeting of Members and Associates of The Sanitary Institute, and others, all shelters should be brought within the purview of the Common Lodging Houses Act, and that the Council of the Institute be requested to take such steps as they think desirable to give effect to this resolution."

The resolution having been seconded was unanimously adopted.

A vote of thanks to the Chairman closed the proceedings.

NOTE.—The Council endorsed the opinion expressed at the Sessional Meeting with regard to private Shelters, and asked Dr. Farquharson to bring the Resolution before the Local Government Board. The Local Government Board have replied: "That the subject has already received the consideration of the Board, and has been noted for further consideration in the event of proposals to Parliament being made for amendment of the Public Health Acts."

INDIAN SANITATION.

By Baldwin Latham, M.Inst.C.E.
(Fellow.)

Read at Sessional Meeting, March 10th, 1897.

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present is an appropriate time for discussing the question dian Sanitation, as India is suffering most severely both pestilence and famine.

e recent outbreak of bubonic plague in Bombay has raised considerable doubts in the minds of some of the Municipal orities in India as to whether certain sanitary works are ficial or not to the health of the country. The unfortunate of affairs in Bombay with reference to its works of age has in a great measure been the cause of throwing doubt upon the beneficial influence of such works of age when carried out in India. There can, however, be doubt, having regard to the conditions subsisting in India, works of sewerage properly constructed and maintained, ring about a sanitary condition favourable to the health of untry. At present there exists no city or town in India has carried out a complete system of sewerage so as to be to convey away with rapidity from the midst of the ation those most dangerous polluting matters which it is ain object of a work of sewerage to remove, and which if d to remain only for a limited time in the midst of a population in such a climate as India, create an abomin- uisance, and are the cause of much sickness and death.

CLIMATE.

ve consider the climatic conditions of India, with its high rature, we can understand how necessary it is for all ic substances of a putrefying character to be removed liately from the vicinity of the habitations. It will be that a system of sewers into which the whole of the discharges enter with the house-water, is the system will ultimately commend itself to the judgment of Sanitarians.

ervations upon the temperature of the ground at Bombay vatory show that the average temperature at a depth of hes, for the years 1849 to 1872, was 82·4 degrees; while at 5 feet in depth, in the years 1851 to 1872, the average temperature was 83·6° Fahrenheit; while at 12 feet in depth, in the years 1851 to 1854, the average temperature was 82·4°. The average temperature of the air in the years 1847-1872 was 79·8°. It will, therefore, be seen that the actual mean temperature of the ground at depths down to 12 feet is considerably in excess of the mean temperature of the air. Consequently the high temperature of the ground will lead to the very rapid decomposition of the contents of cesspools or sewers which are not of a self-cleansing character, and the escape of much noxious effluvia.

The author found, when making observations on the temperature of the sewage of Bombay, that in the early morning of the 2nd February, 1890, the temperature of the sewage varied from 75·7° to 77°, this being in the cold season; while in the lake, in which a mixture of sewage and sea-water was then stored, the temperature of the water was found to be 86·2°, and the mud at the bottom 83·4°. On the 11th March, 1891, the author found the temperature of the ground at Baroda, at a depth of 2 feet, was 83°.

Temperature, no doubt, also exercises a very prejudicial effect on the influence of water supply, and the development of such germs as lead to the production of diarrhœa, just as in this country when the temperature of the public water supplies rises above 60°, more or less summer diarrhœa prevails, and the higher the temperature the greater the prevalence of the disease; but in Bombay, in the cold season, the temperature of the water supply in the early morning was not found to be lower than 73·5°, and the author was informed that owing to the exposed position of many of the supply pipes to the direct influence of the sun, the water supply in the hot season is sufficiently warm to cook an egg that is exposed sufficiently long to its influence.

RAINFALL.

The question of rainfall in India also greatly influences sanitary work. Rainfall may be an agent powerfully potent for good or for evil in India. In many parts of India, as in Bombay, the rain falls with a degree of certainty to which we are unaccustomed in this country. The great falls occur between May and October. In some parts of India, however, rain is distributed more or less at other periods of the year, but as a rule the wettest seasons are when the south-west monsoon is blowing. It is shown that in India, as a rule, the cities and towns are the healthiest in the years when they have the heaviest fall of rain, or in the year following a heavy fall of while these same places are the most unhealthy in the when there is a deficiency of rainfall, or in the year ving a deficiency. Of late years observations have been in order to determine the rate at which rain falls in . At the Observatory at Calcutta in five years—1889 to —the average rainfall was 59·2 inches per annum, the ge for a long period being 65·5 inches per annum. The ge number of rainy days in a year in the five years—1889 93—was 123, so that the average actual amount of rain g in a rainy day was ·481 inches. If all the time in which fell at Calcutta in these five years was added together, it ged 464 hours in one year, or 19⅓ days in one year; and divide the average annual rainfall by the average actual er of days on which it fell, the rate of fall is found to be inches per day, a quantity equal to 7·716 cubic feet per er minute. Of course, there are times when the rate of ll has greatly exceeded this quantity, for it has been ved in Calcutta that 3·25 inches of rain have fallen in one being at the rate of 197·34 cubic feet per acre per minute. mbay the rainfalls are much heavier, the average of all avy falls of rain being slightly over two inches per hour, the greatest fall that has been recorded was 4·22 in an and the greatest fall in a day 16·10 inches. The rain at ay as a rule falls on an average 103 days in the year, the t fall in one month being 52·75 inches, and the largest the year being 123·1 inches.

n, however, would not flow off at the rate at which it falls, w off being in a very great measure governed by the of the surface upon which it falls and also by the extent drainage area. The rain falling upon roofs of houses ved surfaces, of course would flow off with considerable y. Although I strongly advised experiments to be made he quantity of rain flowing off from large cities in time of othing at present has been actually done. You can r arrive at some conclusion as to the amount of rain off the surface by taking the quantity of rain which is in the waterworks' reservoirs in the country in a limited For example at Bombay Waterworks the flow off the in ten days from the 2nd to the 11th July, 1887, into Lake, which has a drainage area of 2,900 acres, with a in these ten days of 29·25 inches, the actual depth into the reservoir was 26·324 inches, so that 90 per cent. rain practically flowed off. During this period, on the ly, nearly 4 inches flowed off the ground in one day, o about 10 cubic feet per acre per minute. In the same e quantity of water flowing off into Tulsi Lake of the

Bombay Waterworks which has a drainage area of 1,450 acres, in six days from the 3rd to the 8th July, the rainfall was 25·44 inches, of which 23·359 inches flowed off. The greatest depth that flowed off in one day was on the 5th of July, when 4·748 inches flowed off, which was equal to nearly 12 cubic feet per acre per minute, the total quantity flowing off in the six days being about 92 per cent. of the rainfall. Such heavy rainfalls as occur in India make it absolutely necessary that in all the districts subject to these heavy falls, rain should be entirely segregated from sewers, and that abundant provision must be made for the prevention of the water-logging of the ground on which the people live, otherwise fever is certain to follow.

WINDS.

The winds of India are especially favourable to a healthy condition of things. The average rate of travel of the wind at Bombay taken over a number of years was twelve miles per hour, but in the south-west monsoon the velocity of the wind increases considerably, and at such times the air is highly charged with moisture, and if it were not for the more brisk movement of the air at the time of the monsoon period, the state of things would become unbearable.

HABITS OF THE PEOPLE.

In India the habits of the people have to be most carefully studied with reference to sanitary matters so as not to offend their sentimental scruples. With the exception of a special class, who are employed in removing the filth of the nation, the people as a rule shrink from contact with anything of a polluting character, and will not do anything to aid in the transport of any such matters beyond their habitations; even in some cases will not pull the handle of a water-closet or the chain of a water-waste preventing cistern, to assist in the operation of removing filth. Yet some of the persons who have such scruples upon the question of pollution do not hesitate to bodily enter the foulest of tanks, the water of which on analysis is found to be worse than sewage, and will use such water both for the purposes of ablution and drink without any qualm of conscience. A person of high caste at Baroda, having been expostulated with for drinking the filthy liquid from a tank in which he was bathing, replied that he did not see why he should not drink it as it was just as pure as his own internals.

Before sanitary work can be successfully carried out in India, it will be absolutely essential that some steps should be taken teaching the benefits of sanitary science at least to the rising eration.

DENSITY OF POPULATION.

he late Dr. Farr pointed out that high mortalities were ciated with the close proximity with which people lived to other, and that overcrowding was one of the great causes uch misery, suffering and death. In this country we can no conception of the crowded state of some of the great s of India. As an example, if we take the whole of the lation of Bombay, and divide it by the whole area governed e Municipality, it shows from the figures of the last census Bombay is peopled at the rate of 57 people to the acre; but very large part of the island of Bombay under the govern- of the Municipality is entirely uninhabited, and as the lation is aggregated in a limited space, the density of popu- in the inhabited areas is extremely great, and in parts of ity of Bombay—in which the plague has made and is making reatest ravages—the density of population differs widely the average density of the whole Municipality, for in the ms of the city called Chuckla and Coombarwada, the ty of the population is about 800 persons to the acre, or lly, one person has 6 superficial yards only allowed to n for all purposes, including his habitation and the public and spaces. In most Indian cities the average density of ation, simply calculating the population on the area ied by the whole city, is seldom less than 100 persons re, and rising in parts, as in the case of Bombay, to still r density. The sanitary measures which have been ed in India, first of all consist of scavenging, works of age, sewage disposal, and water supply. The work of ging as a rule is carried out by a special class, and so the human habitation is concerned, the solid alvine rges of the people are deposited in the closets attached to ming part of the house in baskets, which are more or less , retaining the solids and allowing the liquid to escape, hich are removed daily, and after collection in the cities and in which there are no sewers, the material collected is, as a uried never to be used again, either in trenches which led in as the material is deposited, or otherwise shot into which, when filled, are covered with earth. These ing grounds and pits often emit a most abominable ; and in the pits used in the monsoon season, owing to the temperature of the ground, the material deposited fer- and bursts through the superficial covering which has laced on it, ejecting the deposited material, to the great nuisance of the surrounding neighbourhood. These trenching grounds are usually selected on account of their convenient proximity to the city or town, and consequently are often a source of great danger to the underground water supplies.

In the cities which are sewered like Bombay and Calcutta, the materials collected by this expensive process of manual collection are mixed with a small volume of water, usually at the rate of three gallons per head per day of the population, and in that state are passed into the sewers, and when it is considered that the solid alvine discharges in India are a little more than double those produced by a European population, and the quantity of water used in Indian cities is as a rule about half that used in English towns, there can be little wonder, having regard to the fact that sand is largely used by the people for cleansing purposes, that a system of sewers designed on European lines is not so successful as it might be, and that the materials entering large sewers having insufficient velocity of flow leads to a deposit in such sewers. The collection of ordinary refuse, consisting very largely of vegetable matter, in all the large towns is made daily, and it has been generally used for raising low grounds about the place of collection. The selection of sites for this purpose is also a matter of some importance from a sanitary point of view, as such materials take ten years before they pass into an earthy and comparatively harmless substance. Attempts are now being made in all the large cities to consume this vegetable refuse collected in destructors, but the process has not been generally very successful owing to the absence of coal or cinders in the house refuse, and fuel is required to be provided for burning the green vegetable matters collected.

SEWERAGE.

From what has already been said with reference to the amount of solid alvine discharge of the population of India, there can be little doubt that much of the want of success of the systems is due to the fact that they have been entirely designed upon European lines, sufficient consideration not having been given to the design of these sewers with reference to the work to be performed, and so in most of the Indian cities the sewers have too small a velocity of flow to keep themselves clear without the employment of considerable manual labour. There is also a diminished volume of water supply in many of these Indian towns in addition to the solids and impurities which the waters have to carry, making it ential that the sewers should have a higher rate of velocity n is ordinarily provided in an English town.

n Bombay the works were originally designed for the pose of conveying only twenty gallons per day from each ure inhabitant occupying the city. The solid alvine dis- rges, if equally distributed over these twenty gallons per d, would give a quantity equivalent to about 182 grains per lon of matter in suspension, a quantity enormously in excess he amount of suspended matters ordinarily found in English age, and in the case of Bombay and other cities which have ollect the solid alvine discharges in as dry a state as possible, ing them with only sufficient water to flush them into the ers; this would account for the fact, that, the sewers not g in full use carrying the volume which they were originally gned to carry, become sewers of deposit.

a 1890, the author, when reporting to the Municipal hority of Bombay, stated that "the sewers of Bombay, ead of being put to their legitimate use, have been converted underground receptacles of decomposing filth, and instead owing with an ever moving and living stream, are silted up decaying matters, giving off deadly gases to the positive ry of the health of the people;" and it appears that in bay since the period of that report, instead of doing as they advised, as far as the sewers are concerned, they have nothing towards mitigating the evil, but on the other l they have done exactly that which they were advised not).

'ith reference to the general flow of the sewers in Indian , there does not appear to be very much difference een the rates of flow in India or in English towns. It is d, for instance, at Calcutta that at the maximum hour the ge flow is two and a half times the mean flow, while the mum flow for six hours is just twice the mean flow. The or should here mention that a section of the City of edabad has been sewered experimentally to see whether or ewers constructed on proper lines with adequate falls and ity of flow will keep themselves clear with the small water ies used in India. The result is most satisfactory. The rable Runchorelol Chotaloll, writing to the author with ence to this matter, states that their experimental sewers no deposit in them, and that he cannot understand how it ere is such a difference between the sewers in their city hose in Bombay.

. J. W. Clarkson, Sanitary Commissioner of Bombay ince, in the Report for 1895, page 57, states with reference medabad: "The sewerage of the city gives satisfaction, and extensions continue to be made. The sullage water from the residence of the Maháráj is now connected with the pumping station. The number of private privies which are being turned into water-closets and connected with the sewers is steadily increasing. These water-closets are quite free from smell, and the wash down is good." From this evidence it will be seen that there need be no difficulty in connection with the works of sewerage if works are properly designed, and carried out.

With reference to the question of the disposal of the sewage, this is a matter of considerable importance from a sanitary point of view. It has been shown in India as in other countries, that where ordinary water irrigation has been brought within the confines of a city or inhabited place, as a rule the fever death-rates have risen, so that the damping of the soil in such a climate as India, and other warm countries, would appear to have a noxious influence on human health. This baneful influence, however, does not arise from the irrigation itself, but rather from the stagnation produced in the ordinary mode of irrigation in India and other countries, especially where rice is cultivated. It has been long since shown that in both Piedmont and Lombardy, the cultivation of rice leaving the water in a stagnant condition did increase the fever death-rates in the area irrigated. The same thing doubtless occurs in India, but the experience of Italy clearly shows that an irrigated area laid out like a properly formed sewage farm, not permitting the sewage to pond on the area but allowing it to flow in a gentle stream over the surface, is not detrimental to health, as no injury to health has ever arisen from this description of works.

Unfortunately in India, in all attempts which have been made at sewage farming, the land has not been properly prepared beforehand for the reception of the sewage, and the sewage of Ahmedabad was pumped upon land unprepared for the purpose; but as soon as the errors had been rectified it was shown even in this case that good crops could be grown, and that certainly they have a safe mode of disposing of the sewage if attention is only fairly paid to the proper distribution of the sewage over the land.

WATER SUPPLY.

The question of a pure supply of water in India is one of paramount interest, as the great proportion of the inhabitants of India are exclusively water drinkers; but unfortunately many of the sources of water supply in India are polluted. The sources upon which India depends for water are local wells, tanks, rivers (often polluted from their source downwards), and rage reservoirs, the habits of the people leading as they do the pollution of the ground upon which towns and cities are ilt, and also to the direct pollution of every unprotected irce of water supply. While water is no doubt used for purpose of producing cleanly habits, those who use such ters have no idea of what an injury they are inflicting both on themselves and others in the way such waters are used.

It is essential that every public water supply in India should efficiently filtered, and fortunately in India the engineers e used very much finer sands for filtration than have been d in this country, which has been the means of rendering e waters wholesome. Filtration of drinking-water supplies uld never be neglected in India, and especially in the case river water it is also essential that such waters should be led and filtered on account of the large amount of solid ter in suspension carried at times by such waters. For mple, at Benares, the Ganges in the time of rain has about grains of suspended matter per gallon in the water, dimi- ing in the cold months to about 19 grains per gallon, and he hot months to about 9 grains per gallon.

he most satisfactory results are in evidence at Calcutta as he benefits derived from the introduction of filtered water. water supply was introduced into the town of Calcutta in The deaths for the five years previous to this time were per 1,000, as shown by Dr. Simpson the Medical Officer of lth's Report, and the rate for the five years subsequently 24·4 per 1,000. In recent years, however, the rate of tality has not kept up to the high standard existing in the five years after the introduction of the water supply, as in years from 1877 to 1881 the death-rate was 30·2, and in years 1890 to 1894, 27·5. Calcutta however was infinitely healthy than its suburbs, which however have since been xed to the city and are now undergoing a considerable ioration. The death-rate of the suburbs of Calcutta for five years 1877 to 1881 was 53·8 per 1,000, and in the five 1890 to 1894 it has been reduced to 37·5 per 1,000, ing a most decided improvement since the annexation to utta and the introduction of a filtered water supply. The or may mention that the same result has been experienced hmedabad. In this city previous to 1891, the city derived ater supply from the river at a point below the source of tion, but in this year (1891) the water supply was removed point higher up the river above the city. The consequence een as shown by the Report of the Bombay Sanitary Com- oner for 1895, page 53, that the death-rate which for the ears before the introduction of the water supply was 45·2, and for the five years subsequently was 41·5, shows a reduction, and it is likely that when the whole of the city of Ahmedabad comes to be sewered in the same manner as has been adopted with regard to the trial section, that this death-rate will be still further reduced.

In conclusion, the author may mention a method he discovered of calculating death-rates and so ascertaining the correct population of Indian and other cities and places at the intervals between the census periods. When the author was in India in 1890 he pointed out to the authorities a mode by which from the proportion of births to deaths a very clear idea might be arrived at of the state of mortality. The simplest mode of performing the operation is by ascertaining the percentage of the deaths to the births, and divide this quantity by a figure which is arrived at, at the census period or periods, which would bring the number to a figure equal to the mortality ascertained at the census periods when the population is known. For example, in the year 1891 if the figure arrived at in this way in Bombay is divided by 5·3 it will give a death-rate of 29·15, which is the published death-rate for that year, and the following figures show the difference of subsequent years in Bombay arrived at in the same way :—

Year	Published Death-rate.	Births.	Deaths.	Birth-rate.	Proportional Mortality.
1891	29·15	15,209	23,501	18·86	29·15
1892	32·47	15,213	26,178	18·87	32·47
1893	28·28	14,901	22,802	18·48	28·87
1894	33·38	14,796	26,908	18·35	34·31
1895	30·58	15,371	24,655	19·07	30·26

And at the present time, having regard to the exodus of the population from Bombay, it will be shown that the probable population may be arrived at from the fact that in the three months July to September, 1896, there were 4,210 births and 7,477 deaths, which gives a death-rate for the first three months of 33·51 per 1000, but in the three months beginning with November and ending with January this year, the births had fallen to 3,412, and the deaths had increased to 15,634, showing that the death-rate then was 86·45 per 1,000; and this being the death-rate, if the number of deaths in the year are multiplied by a thousand and divided by the death-rate, it gives the population, showing that the population of Bombay has been reduced from 806,144 in 1891 to 723,336 in the period between September and January last.

Ir. J. W. **Parry** (Anerley) said Mr. Latham in his paper implied the bubonic plague in Bombay is due to the defective sewerage em. Neither the "*Pioneer Mail*" nor "*Indian Engineering*" gives as the cause, but says the plague is due to the overcrowding in ain quarters of the city. The Bombay Medical Officers attribute disease to bad grain; and it is now alleged that the millers in land, in the early part of this century, were attacked by similar lings and developments known as "Millers' Sickness." One ially agreed with Mr. Latham that "a system of sewers into h the whole of the alvine discharges enter with the house water" e system to be adopted in the future; but the first question to nswered is where is the money to come from? Here they had a lar drainage scheme involved, with an outfall, the use of chemicals, so on. Comparatively few municipalities could find necessary s, and Government is unable to lend much on account of the eciated rupee. There is, however, a drainage scheme going on at i and Cawnpur from which no doubt many lessons would be ed. With regard to the winds, Mr. Latham used the expression winds of India are specially favourable to a healthy condition of s;" this requires modification, for it depends upon the direction e winds, and the locality; even during the South West Monsoon s only partially true for the Punjaub and North West Province, on the other hand, he (Mr. Parry) had found the reverse to be ase in Beluchistan and in parts of Madras, the winds giving rise ich fever in the former place by parching up the skin, and in the place by raising the miasma from the reeking vegetation. Parry was not aware that "the discharges of the people were ited in baskets, more or less porous, retaining the solids and ing the liquid to escape;" as a rule one is not permitted (nor ne the desire) to go into the privy of a native's house, but as far e could gather the poorer people used old kerosine oil tins, more ently a broken ghara or baked earthenware pot, acted as the acle for excreta. The wealthier classes and more advanced s use commodes, as Europeans do; while on the State Railway rms small sheet iron buckets are provided. Then with reference water; if the people had to wait till they got filtered water a public water supply they would often have to wait a long time, large portion of the population obtains its water supplies from and as anyone travelling in the country can see, nearly every uses a filter consisting of three chattis or gharas supported on boo frame; the top one containing sand, the next one charcoal, he third the filtered water. The mistake the native makes er, is that he does not boil his water previously to filtering it. Latham had called his paper "Indian Sanitation," but his ks were limited almost entirely to Bombay, Calcutta, and dabad; now India contained more than these three places and ould only regret that such an expert as Mr. Latham had not them some practical suggestions for improving village sanitation, iety per cent. of the people live in the villages, and require nplest possible sanitary measures at the minimum of cost.

Sir DOUGLAS GALTON (London) felt indebted to Mr. Baldwin Latham for the manner in which that gentleman had brought forward the question of the sanitation of Bombay, for although allusion was made to India generally in the title of the paper, yet he referred specifically to the bubonic plague at Bombay in his introduction. To anyone cognisant with this disease it would be known to be similar to that which we in England would call malignant typhus fever, due to overcrowding and insanitary surroundings. Mr. Latham had made a survey of Bombay with a view to securing an improvement in the sanitary condition, but unhappily the Authorities had not followed his advice. Personally he (Sir Douglas) had no doubt the disease now raging was due to the overcrowding and the non-removal of organic refuse. With regard to the sanitation of India generally he could not speak from personal observation, but for the last thirty years his attention had been continually brought to it as a member of the Army Sanitary Committee, which had a mass of evidence on the question. When one looked at the different provinces of India, and knew that there might be from 10,000 to 20,000 villages in a province, each with a large population comprised in it, the difficulty of efficiently dealing with the question of sanitation was at once apparent. The habits of the people vary according to their religion and their caste, and much has to be allowed before one could adopt a system, suitable for a small country like England, in a country comprising the huge extent and varied conditions of India. Some years ago the Army Sanitary Committee introduced the idea of Sanitary Commissioners in the several provinces: these were appointed, and the reports presented by them are most interesting, and well worthy the perusal of anyone interested in the subject. Of these Commissioners, many, notably Dr. Hewlett, travelled among the natives, harangued them, educated them to some extent, and certainly induced them to make some improvements, in the prevention of the fouling of their water supply, and in the removal of refuse. But looking at the number of villages it was impossible for one, two, or three persons to deal effectually with the province. If any real good was to result from some such system it would require a large organization of officers under the Commissioner. Much good had been done. Much had been accomplished, much was in progress that would in time improve the Sanitation of India; and Mr. Latham had brought before them the necessities of the large towns like Bombay and Ahmedabad; and the importance of the municipalities taking the lead in efforts to improve their sanitation.

Dr. K. MACLEOD (London) said that Mr. Latham, in telling them of the habits of the people of India, had represented them in a very unpleasant light, and he would remark that so far as regarded personal hygiene the native of India was exceedingly cleanly, the necessity for it being laid down in their Shasters, or sacred writings, and the practice ridiculous in its elaboration, so that the native is, according to his light, by no means uncleanly. So, too, with domestic ne: houses and utensils are systematically and thoroughly ed, and it is not until one examines the outside of the dwelling evidence of this is wanting. While there is the individual tion, there is no communal concerted cleanliness in the towns 'illages. So with diseases: while most elaborate descriptions given in the Indian medical books of individual diseases and hygienic and medicinal treatment, they were silent upon es affecting the masses of the people and their prevention by ry precaution. What really is wanted in India is education on ry matters, and this ought to be commenced in the schools and d upon the social life of the people; the germ or instinct of iness is inherent in the people and only wants to be developed. with this view that Miss Florence Nightingale, a lady whose would be revered for her works, had suggested that health ners should be appointed to perambulate the villages and :t the natives; this missioner was to be a married man, and he was engaged with the men the wife was to instruct the ı. It was further suggested that he should take a magic ı with him on his travels to illustrate his lectures. This :d very pretty, he admitted, but it would prove impracticable; bably the health missioner, instead of helping villagers, would a bird of prey, for with his opportunities of representing f as an emissary of the Government he would be able to the poor ignorant people to his heart's content. Still, he did why the religious missionary could not combine with his eaching lessons on sanitation; but for some time to come the ıstrument of sanitary education must continue to be the orders 'ernment. The difficulty of sewering Indian towns seemed to be greater than was represented by Mr. Latham: for :e, in Calcutta, where he had acted as Consulting Health the river was actually higher in level than the site of the ıd all sewage had to be pumped up and distributed to swamps lal watercourses to the east of the town—a proceeding not of danger to the public health. On the subject of water there could be no question as to the effect on health of the ction of pure water to the city, for the cholera mortality mptly and considerably: but in the suburbs, which were not lied, the mortality maintained its high level, yet falling in th the introduction of the pure supply.

'OELCKER (London) said that one of the most vital interests onsidered was how to bring sanitary knowledge to bear on the There were great difficulties in the way of the people, for h he did not think their habits were anything like as bad as ıted, they could not be dealt with in exactly the same manner ropean population, owing to their religion and their castes. visiting India for a holiday form the idea that the country of large towns, but it must be borne in mind that India is lly an agricultural country, and therefore they must consider stion of sanitation from an agricultural standpoint; and those who have studied it declare that a dry system of sewerage is to be preferred to the water system. Then again, they must be very careful about hiding the sewage in pipes; the native would remove what he could see, hence arose the difficulties with regard to water supply, in which he could not see the danger, and hence failed to realize the risk he ran by partaking of water from an impure source. Though in thorough agreement with all that had been suggested, he felt that the best work would be to teach the Indians how water may easily be polluted, and how necessary it is for the water to be kept sweet and clean. In the North-West Province Dr. Hankin had done much good by stopping bad water supplies, and allowing those only known to be good to be used. And so with the towns, unless they had a good and sufficient water supply available, they had far better leave the people to their own system of sewerage. As to which system of sewerage was best he thought that for rural districts, and for towns of not too large an extent, the dry system was the best, especially as the sewage was readily convertible into manure for the land. One of the saddest things about India is that with ninety per cent. of the country purely agricultural there was extreme difficulty in procuring manure, and to this want of manure for an exhausted land the famine is so largely due. Sanitation might improve the towns; but for the outlying districts, if they could get a better dry system, the good would be of immense extent, and the country would be less liable to the famines which decimate the people; for the land found best fitted for agriculture was that on which town refuse has simply been spread; and it is known that if you want good cultivation land it must be manured by a certain caste native (who does not object to deal with it) who collects the fæcal and other matter, and properly spreads it over the land. The increased value of land thus treated is shown by the fact that at Allahabad a plot of about two-thirds of an acre in extent, originally worth 4d., is now 30s., this being brought about as stated. In Poonah, where sugar cultivation is largely carried on, the best results are obtained by the use of the town night soil desiccated, and by means of dry ashes converted into a substance easily managed, and greedily secured by the agriculturist. He could from personal observation testify to the great good achieved by the dry system, and in preference to the water system, he would suggest that attention be turned to improving the dry system. In the large cities, Bombay and Calcutta, &c., owing to the difficulties of getting land and the overcrowding that existed difficulties might be raised; yet even there he would rather try to utilize that which is so necessary to the well-being of the people. Another difficulty in introducing the water system to India is the difficulty of getting the people to realize the necessity of cleanliness. What the native could see to be unclean he would remove; but what was in a pipe he would not trouble about. In Umritza (Punjab) he saw a system in which the collectors went into the houses and conveyed the soil thence to depôts outside the town, whence it was taken to the land as required, while the sullage water was conveyed away in open channels, which were kept clean; and although it might be a heinous thing to say to a ıg of modern day sanitarians, he felt it far better to have this · conveyed by open pipes where it had the benefit of fresh air ght, than by closed pipes in which one not infrequently dis- d a leak by which the earth became fouled for a long time.

ı. **R. C. Parsons** (London) said that he had designed and ıtended the execution of sewerage work in South America, the inhabitants were quite as ignorant of sanitation as the of India, yet in Buenos Ayres they had no difficulty in ıg the people to use the sewers in the proper way. This was › the stringent measures laid down and enforced by the ities. The effect of this was to greatly improve the condition people, and he hoped before very long that the death-rate in : Ayres would compare favourably with that of other cities, as found by carefully looking into the municipal health returns ɜ death-rate is decreasing as sanitation improves. Some years had visited Calcutta and was surprised at the condition of there. The stench at the outfall was very offensive, and the eemed to be clogged with sewage matter, and the smell rising ny aperture in the sewers was very bad. In reply to a question as to whether such a condition was not conducive to he was told it was so, and certainly some improvement was cessary. With regard to the question of cost for sewering in India he had made careful calculations, based upon his ıce in South America, and found it would be, in Bombay, for ›, equal to an expenditure of about £2 per head of population. ıuld be a heavy tax, yet it would doubtless be justified by the ment in the health and the conditions of the people which ɜnsue. If the larger centres of population in India were n a satisfactory sanitary condition, the danger of epidemics ing in them and spreading to the country districts would be atly reduced. He believed also if the larger towns, in which ılation is very dense, were effectively sewered it would then easy to determine what would be the best course to pursue erence to the sanitation of the smaller towns throughout the

harles Ollivant (London) drew attention to the differ- ich existed in the conditions met with in town and village ın in India, and also to the fact that the habits of the people › different from the habits of English people, drainage on principles was ineffective, more especially as any domestic a India were certain to be made a receptacle for a large of solid household refuse.

. **Rogers** (London) said that the idea of the introduction of ystem of sewerage into the villages of India was all moon- r the people were too poor to afford it. The dry system is nance with the habits of the people, as it is well recognised sole scavenging of India is carried out by the cattle and the sheep in some parts, and in others by pigs. A great step towards the improvement of the water supply in villages would be taken if a part of each village tank could be set aside by an embankment, and cattle only allowed to go into the separated part; at present the people bathe, wash clothes, and drink the water where the cattle are driven in to drink, necessarily performing other natural functions at the same time, so that the people always drank polluted water.

THE CHAIRMAN (Sir Guyer Hunter) said that he was glad that the vastness of India had been so emphasised during the discussion. Each place must be dealt with by itself, and to talk of a general system of sewerage for India is quite beside the mark. Towns should be dealt with much as towns are dealt with here in England, villages according to circumstances existing locally. He had resided in Bombay many years, was president of the Commission of Sewerage and Water Supply of that city, and therefore could speak with some authority. Mr. Baldwin Latham spoke of the separation of the sewage from the rain water; the Commission entered into this fully, and laid down strict regulations governing it. With regard to the question of the application of the sewage to the land it had been found after exhaustive enquiry and evidence that Bombay was totally unfitted for such a method of disposal, and that the only practicable plan was by the sea, and it was advised that the outlet should be situated some distance out at sea, and not less than six feet below lowest spring tide level. The report issued by the Bombay Commission is still obtainable, and he thought was well worth a careful perusal by any one interested in the matter. He was sorry to say the advice tendered in the report had been but very partially followed; had it been otherwise the health of the city, he believed, would to-day be very much better than it was. With regard to the question of cost the Commission found that their recommendation of sewering the city could be carried out practically without increase of taxation. It was only by educating the people of India they could hope to impress upon them the advantage of good sanitation, and with Sir Charles Ollivant he thought it would not be advisable to try to force western views in their entirety on the people of India; many of their habits, moreover, though not dreamed of in our philosophy, it would be neither wise nor polite to interfere with.

A cordial vote of thanks having been accorded Mr. Baldwin Latham for the paper read, that gentleman, in acknowledging the vote, traversed some of the remarks made in the discussion. With regard to the observations of Mr. Parry, he felt that he had somewhat misunderstood the intent of the paper read, as the bubonic plague had not been ascribed to the sewage of the place. He had had experience with other large cities and he had found a general agreement, for looking at the health statistics now being prepared by the Government, one was struck by the remarkably healthy condition of India as a whole. It was in the towns where they must begin the work of improvement. Generally, the towns of India were so flat

ural drainage could not be resorted to, and where they were
ed to pump, it was only a question of securing a better fall,
as from the slackness of the fall, and the fact that the sewers
t properly used, that they became foul. Bombay had magni-
aterworks, with its stone dam over three miles in length—
neering feat which we have nothing approaching in this
and one that would be a monument to the skill of their
s. For this the money had been found and the work carried
tually, to the great benefit of Bombay. With regard to the
pply and its influence on the health of the people, they had the
sible evidence. In 1888 when the main supply burst, and
d to be made to the old well system, an outbreak of cholera
which, on the reinstatement of the fresh water supply, sub-
e connection here between the water supply and disease being
r. The dry system of sewerage had been referred to, and with
to it he would say he had visited Poonah, and from
he had obtained he found that as the result of the treat-
sewage for manurial purposes carried on there, the results
r one-half per cent., while it was further alleged where the
re treated by this system of manure the sugar did not
crystallise. He should have liked the opinion of some of
sent on this point. But as he had said, let them begin in the
r when the people were educated on the principle and the
ults were realized, the truth would ramify and become
hroughout. So far as the rainfall affecting health, he had
vet years were the unhealthy ones; no better exemplifica-
his could be found than the year 1877, when the famine
n after the dry season; and so it would be this year.

thanks to the Chairman concluded the proceedings.

REVIEWS OF BOOKS.

WASTED RECORDS OF DISEASE.*

In raising a voice on behalf of the utilisation of a vast amount of wasted records of disease, Dr. Paget is no pioneer; he is following in the footsteps—as he reminds us in the preface—of many eminent men (Sir John Simon, Dr. Rumsey, Dr. Ballard, Sir Benjamin Ward Richardson, Dr. Milroy, and, as recently as last year, Dr. Newsholme). Several of these have devoted energy, time, and money in attempts to secure or establish permanent systems of disease registration, and their efforts, as briefly narrated in this volume, furnish most interesting reading. The result was the same in each instance: in proportion as the registration became more and more effective, the trouble, difficulties, and expense attendant on the carrying out of the scheme became too great for gratuitous individual enterprise, in the absence of all official support; and so, after a struggle, it was relinquished. It was work which the State alone could perform with facility and completeness, and, as befitting its importance to the nation, it was work which the State should have undertaken years and years ago.

But what legislative recognition has already been made of the need for disease registration has come very slowly; even the notification of infectious disease was not initiated by a strong Government legislating in the interests of the health of the people, for the Act was introduced into the House of Commons many years after its value had been abundantly proved by local enterprise.

Such returns of *non-infectious* disease as there are, continue to be woefully wasted, and Dr. Paget very properly maintains that all the sickness treated at the public expense (Poor Law) should be properly registered and made generally useful to the nation; that returns of Hospital sickness, the Friendly Societies' records, and those of the Post Office, the Police, the Army and Navy, should be required by the Legislature to be furnished to, and systematically collected by, a central authority. The results should then be published weekly so far as they relate to zymotic disease, and monthly so far as the other diseases are concerned. The bulk of sickness occurring in the country would then be known, its particular incidence in kind and locality appreciated, and the basis of preventive measures more correctly established.

The mere registration of mortality is an insufficient procedure, and it is discreditable to the State, seeing the important scientific results that would accrue from the collection of available sickness returns, that these are allowed to run to waste, because, forsooth, it has been made no one's business to collect and publish them. This is not as it should wanton waste of what everyone must admit is most valuable ; and all those who are interested in the Public Health of ntry will be grateful to Dr. Paget for raising his voice, so ly and so well, on a matter which should not be allowed to l it has been placed on a satisfactory basis.

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* Wasted Records of Disease, by Charles E. Paget, Lecturer on Public Health in the Owen's College; Examiner in Public Health in the Victoria University; Medical Officer of Health for the County Borough of Salford. 8vo. Edward Arnold, London and New York. 1897.

H. R. K.

NOTES ON BOOKS AND PAPERS IN TRANSACTIONS.

Medical Department Report for the year 1895." Vol. VII. 421 pp., 8vo. *Eyre & Spottiswoode. London, Price 4/-.*

Appendix to this Report Surg.-Colonel Prof. J. Lane Notter, .D., deals with the progress of Hygiene for the year 1896, e following heads—*Legislation; Literature* (most of the ntioned have appeared in the Lists of Donations to the f the Institute); *Work of Societies*, comprising a resumé of s read at the Public Health Section of the Meeting of the Medical Association of Carlisle, and the Congress of The Institute at Newcastle-upon-Tyne; *Special Points in* include notes on Enteric Fever, Small-pox, Cholera, Dis- of Rooms by Formaldehyde Vapour, Foods, Influence of Factor in the production of Disease, &c.

tical Treatise upon Warming Buildings by Hot Water, on Heat and Heating Appliances in general, with an y respecting Ventilation, the cause and action of hts in Chimneys or Flues, and the Laws relating to stion, by Chas. Hood, F.R.S., &c., re-written by rick Dye. Third New Edition, fully revised to date. ., 8vo. *E. & F. N. Spon, London; and Spon & Cham- , New York*, 1897. *Price 15/-*

ok contains a large number of illustrations. There are 26 ealing with Heat, Circulation of Water and Air in Pipes, of Pipes, Horticultural Works, Boilers, Warming Buildings ntial and for Business purposes, Pipes, Fittings, Coils and Low and High Pressure System Apparatus, Warming by Heated Air, &c., &c.

al chapter is devoted to The Metropolitan Buildings Act, tion to Hot Water, Steam, and Hot Air Works, and to and Smoke Flues.

pendix contains a number of Tables and Memoranda o Temperatures acquired by steam or water at certain Expansion of Air and other Gases by heat when free from elocity of Chimney Draught at different Temperatures, Specific Gravity and Expansion of Water at different Temperatures, Hydraulics, &c., &c.

"Proceedings of the Incorporated Association of Municipal and County Engineers." Vol. XXII. 1895-96. Edited by THOMAS COLE, Secretary of the Association. 363 pp., 8vo. *E. & F. N. Spon, London; and Spon & Chamberlain, New York*, 1896. *Price 12/6.*

The Volume contains the records of the papers and discussions at the District Meetings of the Association at Londonderry, Westminster, King's Heath, Kew, Hanley, and Brighton. Nearly all the papers have an interest from a sanitary standpoint, and among others may be noted "The Richmond Sewerage Works," by W. Fairley: "River Pollution," by Prof. H. Robinson; "Disposal or Utilisation of the Residue from Town Refuse Destructors," by H. Percy Boulnois: "Housing of the Working Classes," by J. H. Brierley, &c.

"The Institution of Civil Engineers, Minutes of Proceedings of." Vol. CXXIII. 1895-96. *London.* Part I.

Among the "Abstracts of Papers in Foreign Transactions and Periodicals" the following have a Sanitary interest:—

The Hygienic Significance of Dry Rot, by Dr. Emil Gotschlich (Zeitschrift für Hygiene, 1895, p. 502).

The Water-works of Syracuse, N.Y., by W. R. Hill, M.Am.Soc. C.E. (Transactions of the American Society of Civil Engineers, July, 1895, p. 23).

The Milwaukee Water-works Intake (Engineering News, New York, Sept. 19th, 1895, p. 177).

The Newhouse Adit at Idaho Springs, by A. Lakes and W. H. Wiley (The Engineering Magazine, New York, 1895, p. 49).

On a New kind of Well in the Granite Rocks of Sweden, by — Nordenskiold (Comptes Rendus de l'Académie des Sciences, Paris, Vol. CXX., 1895, p. 857).

The Spontaneous Separation of Iron from Subsoil-water; and a Method of treating Well-water, by Dr. A. Lübbert (Zeitschrift für Hygiene, 1895, p. 397).

The Steam-Disinfection and Sterilization of Wells and Tube-Wells, by Dr. Max Neisser (Zeitschrift für Hygiene, 1895, p. 301).

The Preparation of Germ-free Drinking-water by means of Calcium Chloride, by Dr. Bassenge (Zeitschrift für Hygiene, 1895, p. 227).

The Cholera Outbreak in the district of Oppeln in 1892-94, by Dr. E. Roth (Deutsche Vierteljahrsschrift für öffentliche Gesundheitspflege, 1895, p. 569).

The Purification of Sewage by Forced Aëration, by G. E. Waring, M.Inst.C.E. (Report on an Experimental Investigation).

Vol. CXXIV. 1895-96. Part II.

This Volume contains in the "Minutes of Proceedings" a lengthy paper and discussion, covering 94 pages, on "The Sanitary Works of

s Ayres; Sewerage, Drainage, and Water Supply," by the
Richard Clere Parsons, M.A., M.Inst.C.E.

ong the "Abstracts of Papers in Foreign Transactions and
icals" are:—

ort on Anderson's Revolving Purifiers and Filtration Experi-
at Agra, by S. Crawshaw, Municipal Engineer.

stigations respecting the Pollution of Wells by Water entering
he bottom, by Dr. E. Pfuhl (Zeitschrift für Hygiene, Vol.
1866, p. 1).

-dust Water-closets with separate treatment of the Excreta,
Z. Koiransky (Gesundheits-Ingenieur, 1895, p. 357).

Municipal Station for the Burning of Refuse in Berlin
en für Gewerbe und Bauweser, Dec., 1895, p. 209).

Heating and Ventilation of Passenger Trains, by Jules Dery
in de la Commission Internationale du Congrès des Chemins
1895, p. 3251).

Preventable Wastes of Heat in the Generation and Use of
by W. Kent (Journal of the Franklin Institute, December,
. 406).

mokeless Combustion and Boiler Firing, by W. Hempel (Stahl
en, Vol. XVI., 1896, p. 87).

nmable Gas in Non-Fiery Mines (Annales des Mines, Vol.
.895, p. 1).

XXV. 1895-96. Part III.

g "Other Selected Papers" is one of Sanitary interest by
itterworth on "Loughborough Sewage and Refuse Disposal

among "Abstracts of Papers in Foreign Transactions and
als" are:—

unicipal Waterworks of Berlin (Gesundheits-Ingenieur, 1896,

rations upon Filters of various kinds, by F. Breyer (Gesund-
genieur, 1896, p. 90).

one-Slab Filters on the Fisher System at Worms, by Dr.
(Mittheilungen über Gegenstände des Artillerie und Genie-
1896, p. 265).

iments to demonstrate the presence of Vibrios, resembling
Cholera in Water-courses, by Dr. O. Neumann and Dr. E.
itschrift für Hygiene, 1896, p. 363).

alue of Formalin (Formic Aldehyde) as a Disinfectant, by
Valter (Zeitschrift für Hygiene, 1896, p. 421).

anger of Sewer-Gas and the exclusion of the same from
s, by Dr. M. Kirchner (Deutsche Vierteljahrsschrift für
e Gesundheitspflege, Vol. XXVIII., 1896, p. 152).

holera in Hamburg, by Prof. Dr. v. Pettenkofer (Gesund-
enieur, 1896, p. 88).

nd Working Expenses of the Breslau Irrigation Works, by
s (Gesundheits-Ingenieur, January 31st, 1896, p. 23).

The Products of Combustion of Gas-flames, by Dr. H. Bunte (Journal für Gasbeleuchtung, 1895, p. 499).

Vol. CXXVI. 1895-96. Part IV.

Two papers in the "Minutes of Proceedings" are of special sanitary interest, having regard to Water Supply; with the discussion and correspondence they make 121 pages.

The Thirlmere Works for the Water Supply of Manchester, by G. H. Hill, M.Inst.C.E., and The Vyrnway Works for the Liverpool Water Supply, by G. F. Deacon, M.Inst.C.E.

Among "Other Selected Papers," is one by Mr. R. Godfrey, Assoc.M.Inst.C.E., on "A New form of Dual Drainage."

Those among "Abstracts of Papers in Foreign Transactions and Periodicals" are:

The Water Supply of Quimper, by A. Considère (Annales des Ponts et Chaussées, April 1899, p. 495).

The Waterworks of Astoria, Oregon, by A. L. Adams, M.Am. Inst.C.E. (Transactions of the American Society of Civil Engineers, April 1896, p. 201.)

The Purification of the Subsoil, by H. Koschmieder (Gesundheits-Ingenieur, 1896, p. 192.)

On the Nature and Treatment of Ferruginous Subsoil Water, by Prof. Dr. Dunbar (Zeitchrift für Hygiene, 1896, p. 68.)

The use of Formic Aldehyde Gas for the Disinfection of large Apartments, by Prof. Dr. E. Pfuhl (Zeitschrift für Hygiene, 1896, p. 339).

Electric Traction in the Paris Sewers, by A. Dumas (Le Génie Civil, July 18th, 1896, p. 177).

Hygienic Legislative Enactments against Lead-Poisoning, by Dr. Wegener (Deutsche Vierteljahrsschrift für öffentliche Gesundheitspflege, 1896, p. 483).

"Report of the Sixty-sixth Meeting of the British Association for the Advancement of Science, held at Liverpool in September, 1896." 1051 pp., 8vo. *John Murray. London,* 1896.

In this volume among the papers dealing with the various branches of science there are several that have a more or less direct bearing upon Public Health and Sanitation, such as "Street Lighting by Electric Incandescent Lamps," by W. G. Walker; "On Different Forms of the Respiration in Man," by W. Marcet, M.D., F.R.S.; "Organisation of Bacteriological Research in connection with Public Health," by G. Sims Woodhead, M.D.; "Bacteria and Food," by A. A. Kanthack, M.D.; "Experiments on the Action of Glycerine upon the growth of Bacteria," by S. Monckton Copeman, M.A., M.D., and F. R. Blaxall, M.D., D.P.H.

THE SANITARY INSTITUTE.

NNUAL REPORT OF THE COUNCIL
FOR THE YEAR 1896.

d at the Ordinary General Meeting, March 24th, 1897.

INTRODUCTION.

eneral indifference to Public Health questions that formerly ed is happily now extinct; and so widely have the teachings tary Science been received by all classes during the last few , that what is now needed is not so much an awakening of lic as to the necessity for combating preventable diseases, as arting of instruction in the best methods to be employed in lishing this important task.

esenting this, their Twenty-first Annual Report, the Council of nitary Institute desire to point out that they have endeavoured t this need by developing the educational value of the s, lectures, and demonstrations at the Institute, and by ments in the permanent Museum and Library; while out the country the Congresses held by the Institute, and the ions connected with them, are rapidly increasing in im- e, and in the influence that they have on matters connected wide field of Sanitary Science.

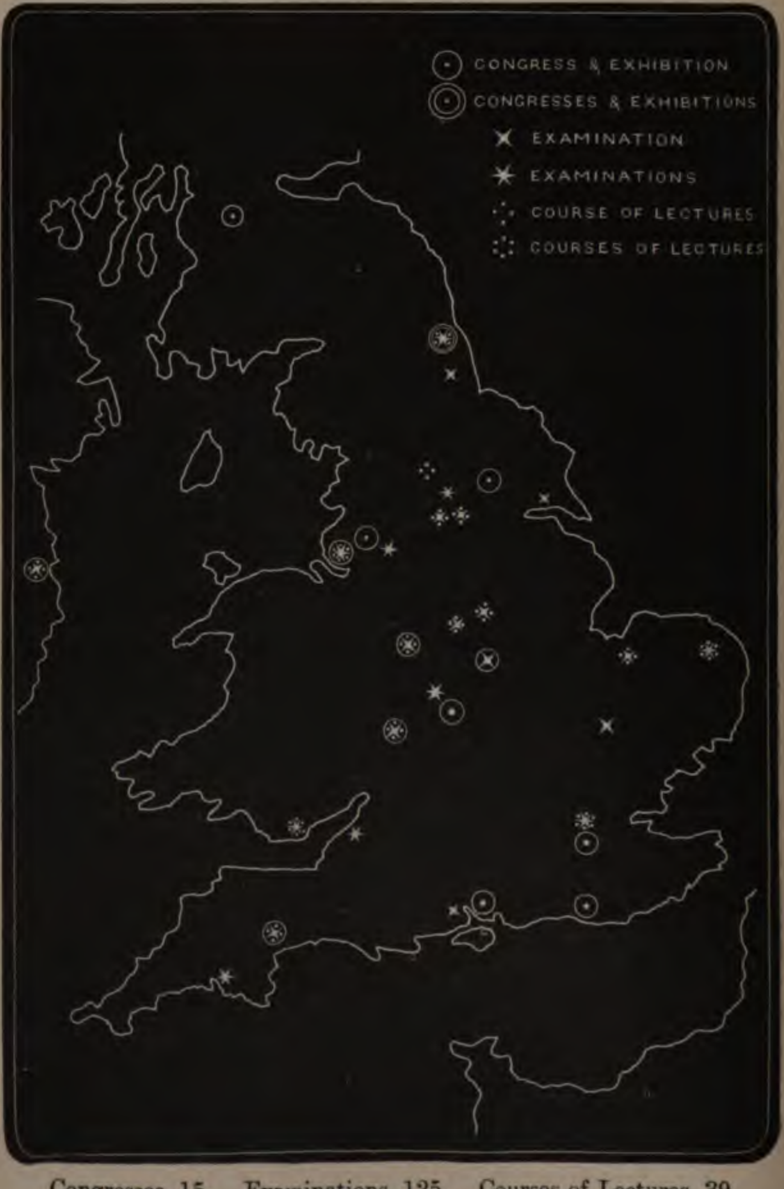
etch Map, showing the centres to which the work of the e has been extended, is given on the following page.

SESSIONAL MEETINGS.

nal Meetings for the discussion of subjects of interest to ans were held in February, March, April, and December. eetings afford an opportunity for an interchange of opinions the Members and Associates of the Institute, and the will be glad to receive from time to time notice of any which are thought desirable for discussion. During the following subjects were brought forward:—

nfluence of Sub-soil Water on Health." S. MONCKTON COPE-, M.A., M.D., M.R.C.P.

Map showing the various centres to which the work of The Sanitary Institute has been extended.



Congresses, 15. Examinations, 125. Courses of Lectures, 39.

Isolation of Cases of Infectious Diseases in the Metropolis." AUGUSTUS CHARLES SCOVELL, J.P., Chairman of the Ambulance Committee of the Metropolitan Asylums Board.

tory and Workshop Acts, and the Powers and Duties of Saniary Authorities with regard to Workshops." JOHN F. J. SYKES, .SC., M.D., Medical Officer of Health, St. Pancras.

Purification of Sewage by Bacteria." SAMUEL RIDEAL, D.SC., .I.C., F.C.S.

papers read during the earlier part of the year, with the ions upon them, have already appeared in the Journal, Vol. The paper by Dr. S. Rideal is published in Part I. of the l for 1897, p. 59.

attendances at the meetings varied from 80 to 130.

TURES AND DEMONSTRATIONS ON SANITARY SCIENCE.

twenty-first and twenty-second courses of Lectures and strations were held during the year in London. In February arch 73 Students entered their names, and in October and ber 81 Students.

mplete list of the Lectures has been given in Vol. XVII. of rnal.

INSPECTIONS AND DEMONSTRATIONS.

ake the course of training given by the Institute as practical ible, arrangements were made for the Students to visit the mentioned below in order that they might have the opportunity rving and noting the difficulties that have to be met in the l application of Sanitary principles to various trade processes. nes of the gentlemen who arranged the visits and conducted dents are also given:—

tizans' Dwellings in the Boundary Street Area. OWEN FLEMING, Architect's Department, London County Council.

st London Water Works, Lea Bridge. W. B. BRYAN, M.INST.C.E., Engineer to the Company.

ern Barnet Sewage Works. E. J. REYNOLDS, ASSOC.M.INST.C.E., Surveyor to the District Council.

rking Sewage Outfall Works. J. E. WORTH, M.INST.C.E., District Engineer, London County Council.

thwark and Vauxhall Water Works, Hampton. J. W. RESTLER, M.INST.C.E., Engineer to the Company.

Aylesbury Dairy Co. J. A. HATTERSLEY, Managing Director (2 inspections).

Ealing Sewage and Destructor Works. CHAS. JONES, M.INST.C.E., Engineer and Surveyor to the District Council (2 inspections).

Beddington Sewage Irrigation Farm, Croydon. THOS. WALKER, M.INST.C.E., Borough Engineer.

Express Dairy Company's Farm, College Farm, Finchley. G. TITUS BARHAM, Managing Director.

Inspection and Demonstration at Mitcham. Dr. L. W. DARRA MAIR, M.O.H., Croydon Rural District Council.

Wimbledon Sewage Works and Farm. C. H. COOPER, ASSOC. M.INST.C.E., Engineer and Surveyor to the District Council.

Knacker's Yard. HARRISON & BARBER (2 inspections).

East London Soap Works. E. COOK & Co.

Odam's Manure and Chemical Works, Victoria Docks, E. C. T. MACADAM, F.C.S., General Manager.

Inspection of Drainage Alterations and Testing. J. FOXLEY NORRIS.

Metropolitan Cattle Market.

Disinfecting and Filtering Appliances, at J. Defries & Son's premises, Houndsditch, E. (2 inspections).

Casual Wards and Disinfecting Station, Chelsea. LOUIS PARKES, M.D., D.P.H.LOND., Medical Officer of Health, Chelsea Vestry (2 inspections).

St. George's, Hanover Square, Sanitary Works in different stages of progress, Disinfecting Station, Mortuary, &c., Model Dwellings (Gatliff Buildings), and Routine Office Work of a Sanitary Inspector. A. TAYLOR, Chief Sanitary Inspector (4 inspections).

London County Council's Common Lodging House, Parker Street, Drury Lane. FRANK J. RUDDLE, Estates and Valuation Dept., L.C.C. (4 inspections).

Richmond Main Sewerage Works. W. FAIRLEY, ASSOC.M.INST.C.E., Engineer.

Disinfecting Apparatus and Model Steam Laundry. W. G. LACY (2 inspections).

ring the period over which each course of Lectures extended tudents had the free use of the Library and Museum at all when they were open, and a special time was set apart each for the Students to examine the Museum with the assistance Curator.

the convenience of those Students who wish to borrow books me reading, special arrangements have been made for the loan m, at a small fee, of books from Lewis's Medical and Scientific y, which contains a large number of recent text books and rd Sanitary works. This arrangement is also available for ers and Associates of the Institute.

onsequence of the Report of the Royal Commission on Tuber-, attention has been much directed to the important question od Inspection. There appeared to be no means available nitary Inspectors for obtaining any information on this ant subject, and the Council therefore organised, in con- with the Lectures, Special Demonstrations with regard to the tion of Meat. The Students were taken, under competent ce, to one of the London markets to see the methods of ering and preparing meat; and demonstrations were given upon casses as to the normal appearance of healthy meat, and as to to look for abnormal appearances indicating disease or un-ess. Further demonstrations were given in the Museum, to carcasses and portions of animal tissue affected by various were sent from different parts of the country, by the s of the Medical Officers of Health. These specimens, and ases which they illustrated, were carefully explained to the ts, and they had the opportunity of closely examining the nce of the specimens both before and after the demonstration.

e Classes, held by the Institute, as mentioned in the last Re-re becoming known abroad, and during the year application n received from the United States of America for information gard to the formation of classes, and the syllabus teaching purpose.

Council desire to record their sincere thanks to the Lecturers great benefits they have conferred upon the Students, and assistance they have given to the diffusion of Sanitary know-y the preparation and delivery of these Lectures, and also e gentlemen who have taken so much trouble to make the inspection and demonstration visits instructive to the s.

EXAMINATIONS.

IN PRACTICAL SANITARY SCIENCE.

Three Examinations were held: two in London, and one in Liverpool. Sixty-one candidates presented themselves, to 38 of whom Certificates were granted.

In December one of these Examinations was held for the first time in the Provinces, and the Council decided in future to hold them at the same times and places as arranged for the Provincial Examinations for Sanitary Inspectors.

FOR SANITARY INSPECTORS.

Examinations were held at the following places:—

- Birmingham.
- Cardiff.
- Leeds.
- Liverpool.
- London (2 Examinations).
- Newcastle-upon-Tyne.
- Plymouth.

At these Examinations 521 Candidates presented themselves, and 300 were certified competent, as regards their Sanitary knowledge, to discharge the duties of an Inspector of Nuisances under the Public Health Act, 1875, or of a Sanitary Inspector under the Public Health (London) Act, 1891.

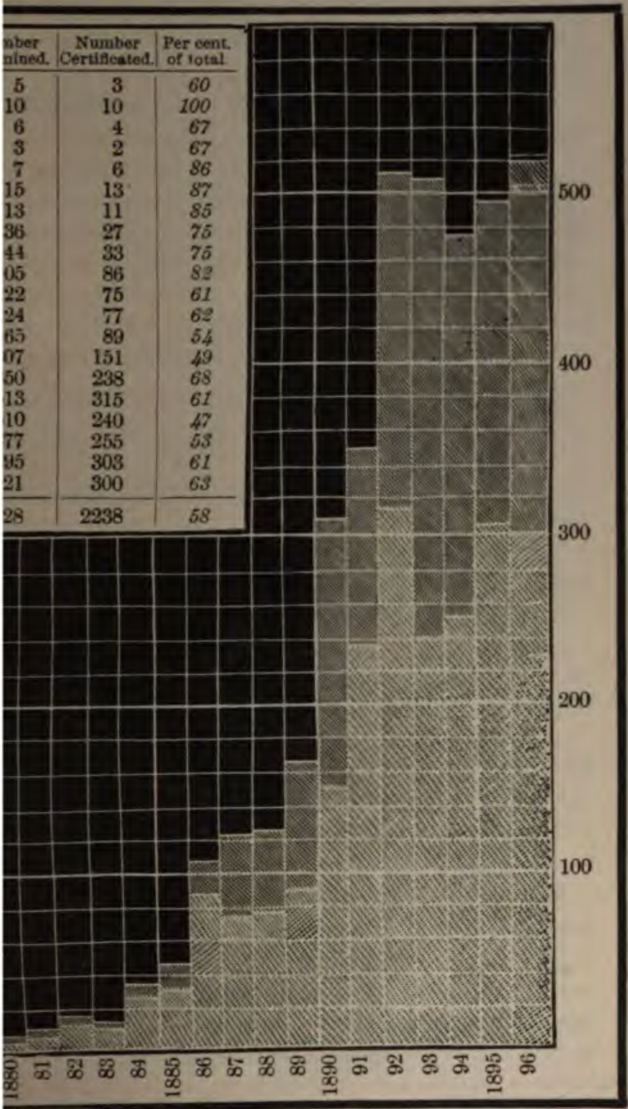
The Examinations were established in 1877, and the following figures show the total number of Examinations held, and the number of candidates:—

	Examinations.	Candidates Entered.	Candidates Certificated.
For Local Surveyors	35	291	142
Practical Sanitary Science	5	101	57
Sanitary Inspectors	85	3,828	2,238
	125	4,220	2,437

A Table and Diagram relating to these Examinations is given on the opposite page.

The Certificates of Competency granted by the Institute are now required for all newly appointed Inspectors in London; are specified in many of the advertisements of Provincial Authorities; and are also sought in Colonial appointments. In some districts the Inspectors already in office are encouraged to enter for an Examination, by the Local Authorities paying the whole or part of the Examination fee, or by the Inspector being given an increase of salary on obtaining a Certificate.

ram showing the number of Candidates examined and year. Relating to Inspectors' Examination only.



mber nined.	Number Certificated.	Per cent. of total
5	3	*60*
10	10	*100*
6	4	*67*
3	2	*67*
7	6	*86*
15	13	*87*
13	11	*85*
36	27	*75*
44	33	*75*
05	86	*82*
22	75	*61*
24	77	*62*
65	89	*54*
07	151	*49*
50	238	*68*
13	315	*61*
10	240	*47*
77	255	*53*
95	303	*61*
21	300	*63*
28	2238	*58*

umber of Candidates is shown by the whole height of the column number who have obtained Certificates by the lighter portion.

The scheme before the Local Government Board for the formation of a Sanitary Inspectors' Examination Board, composed of representatives from various Societies, is still under consideration.

Applications have been before the Council with regard to establishing Examinations in the Colonies and the matter is under consideration.

The Examinations, particularly those held in the Provinces, take up considerable time and involve a large amount of work on the part of the Examiners, but the whole of this work has been undertaken by them during the year without any remuneration whatever; and the Council feel that the thanks of the Institute are specially due to them for these entirely gratuitous services.

CONGRESS AND EXHIBITION.

The Fifteenth Congress and Exhibition of the Institute was held at Newcastle-upon-Tyne, from September 2nd to 9th, by invitation of the Mayor and Corporation. This is the second time that the Institute has visited that city, the previous occasion being in the year 1882.

H.R.H. The Duke of Cambridge, K.G., President of the Institute, attended the Congress, and opened the Exhibition.

Very suitable accommodation was provided for the meetings of the Congress in the University of Durham College of Medicine, the Durham College of Science, and the meeting room of the Presbyterian Church.

The numbers attending the Congress were as follows:—Delegates, 515; Members and Associates of the Institute, about 210; Associates of the Congress, 350; making a total attendance of over 1,000.

Delegates were appointed by 203 Sanitary Authorities, and by 36 Societies and Associations.

Many valuable papers were contributed to the meeting, and have been published in the Journal.

The Health Exhibition was held in Olympia, and was open twenty-two days. It was attended by 51,000 visitors. A list of the Exhibits, to which medals and certificates were awarded, is given in Part III. of the Journal for 1896, and also a list of certain Exhibits which required special tests in London or elsewhere before their merits could be decided upon by the Judges.

The following exhibitors have since received Letters of Thanks from the Exhibition Committee:—

Rev. Principal Gurney and the Teachers and Students of the urham College of Science, for Plumbing Work executed by ie Students.

ish Institute of Preventive Medicine, for Bacteriological xhibit.

Northern Counties School of Cookery, for Table Decorations id Food Specimens.

lton & Co., for their Exhibit of Baths, Lavatories, and nitary Appliances.

y & Son, for their Exhibit showing general excellence of sign and workmanship.

phreys Limited, for the accommodation afforded in temrary Hospital.

astle Waterworks Co., for Exhibit of Pipes, Fittings, and ier Apparatus.

ers' Shipbuilding & Iron Co., for their Exhibits of Models a Torpedo Destroyer, a Torpedo Catcher, and a first-class rgo and Passenger Steamer.

y Walker & Son, for Exhibit of Marble, Mosaics and Brass ork.

resting feature in the Exhibition was the Demonstrations ntgen X Rays, in the Model Hospital in the Grounds, a for admission being charged; the proceeds were presented l for the Newcastle Infirmary.

be mentioned that an illustrated list of the Exhibits to rds have been given by the Institute at their various s is published.* It is hoped that this Illustrated List will y the professions and the public a serviceable guide in the f Sanitary apparatus and appliances.

relating to these Exhibitions is given on the following

SANITARY LEGISLATION.

r Bills of a sanitary nature were introduced during the

liamentary Committee of the Institute had before them d to the Council upon the following Bills. The action e Council and the fate of the Bill is noted in each case:—

Registration Bill. Brought in by Mr. Knowles, Earl ton, Mr. Dixon, Dr. Farquharson, and Mr. Sexton.

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list can be obtained at the Offices of the Institute, price 1/-.

EXHIBITIONS HELD IN CONNECTION WITH THE CONGRESSES OF THE INSTITUTE.

	1877. Leamington.	1878. Stafford.	1879. Croydon.	1880. Exeter.	1882. Newcastle.	1883. Glasgow	1884. Dublin.	1885. Leicester.	1886. York.	1887. Bolton.	1889. Worcester.	1890. Brighton.	1892 Portsmouth.	1894. Liverpool.	1896. Newcastle.
Number of Exhibitors	117	116	189	106	110	126	134	135	130	112	108	108	156	146	100
Number of Exhibits	294	319	710	500	600	750	900	1,000	900	800	800	1,000	2,000	—	—
Space occupied (in square ft.)	......	......	......	9,725	14,520	20,000	40,000	30,000	30,000 and Gr'nds	25,000	28,000 and Gr'nds	30,000 and Grounds	35,000 and Grounds	25,000	17,310 and Grounds
Number of days Exhibition was open	14	16	17	19	25	25	19	17	26	29	23	18		24	22
Total number of Visitors	......	......	......	8,955	8,373	20,000	35,000	37,000	30,000	27,000	23,000	35,000	49,000	48,189	51,000
Number of Medals awarded	13	13	12	12	15	21	18	34	16	14	30	32	21	29	56*
Number of Special Certificates	None.	6	9	7	4	13	11	11	12	9	None.	None.	None.	None.	None.
Number of Certificates	None.	22	38	40	72	58	83	79	64	40	71	88	76	56	None.
Number of Exhibits deferred for further trial	......	7	52	30	37	44	39	119	42	46	67	67	38	59	44

* These do not include all the awards which may be given for Exhibits selected for further practical trial.

This Bill, which was first introduced in 1872, was again brought forward. The Council petitioned against the Bill, which was not reached before the close of the session.

Rivers Pollution Prevention Bill. Brought in by Mr. Wyvill, Sir Francis Powell, Mr. Henry Hobhouse, Sir John Dorington, Sir Henry Howarth, Dr. Farquharson, Mr. Brigg, Sir John Brunner, and Mr. Kenrick.

A Bill to make more effectual Provision for prevention of the Pollution of Rivers and Streams. The Council petitioned in favour of this Bill, but suggested that the clause relating to solid matter in suspension should be so amended as to include this as a pollution. The Bill was not reached before the close of the session.

The following Bills were also considered, but the Committee reported to the Council that they did not contain provisions that made it desirable for the Institute to take any action with regard to them:—

London County Council General Powers Bill.
The Sale of Foreign and Colonial Meat Bill.
The Cemeteries Bill.
Bill to amend the Metropolitan Management Act.
The Burial Bill.
The Public Health Bill.
Working Men's Dwellings Bill.

PARKES MUSEUM.

The Lectures and Public Meetings held in the Museum have been well attended, and the daily visitors, who are admitted free and of whom no record is kept, have been quite up to the average.

It is estimated that over 22,000 persons visited the Museum during the year ending December, 1896.

The following table shows a slight decrease of Classes and Students as compared with 1895, but it is well above the average for the past five years:—

Date.	Institutions.	Classes.	Students.
1892	13	68	854
1893	21	87	1043
1894	28	48	865
1895	50	93	1695
1896	49	82	1435

List of Institutions.

Among the Institutions represented by the above Classes were the following:—

Hackney Institute.
Grafton Road Science Class.
Woolwich Polytechnic.
Brompton Higher Grade School.
Stepney College.
Worthing Institute.
Battersea Polytechnic.
London Hospital.
Charing Cross Medical School.
College of Preceptors.
National Health Society.
Home and Colonial Institute.
St. Thomas's Hospital.
Royal Engineers' Corps.
People's Palace.
Polytechnic, Regent Street (Hygiene Class).
Guy's Hospital.
Polytechnic, Regent St., (Plumbing).
Medical Post Graduate Course.
Surrey County Council (Wimbledon).
Nurses' Institute.
Westbourne Park Institute.
St. Andrew's Institute, Highbury.
Bow Common Institute.
Bedford College.
University College, London.
Polytechnic, Regent St., (Building Course).
Addy's Science School.
Goldsmiths' Institute.
Dame Owen's School.
Westminster Technical Institute.
Green Coat School of Science.
William Street Polytechnic.
South Norwood Polytechnic.
City of London College.
Charter House School of Science.
Grenell Road School of Science.
North-East London Institute.
Metropolitan Nursing Association.
Wandsworth Technical Institute.
Glengall Road School of Science.
Montem Road School of Science.
Clarendon Sq. School of Science.
Maria Grey Training College.
Borough Road Polytechnic.
Aldersgate Y.M.C.A.
Clyde Street Science Class.
Architectural Association.
Stoke Newington Technical Class.

Among the new exhibits added to the Museum during the year are several additions to the Bath and Lavatory Section; a specimen of Wooden Water Pipe from the Manor House, Chelsea; a model of a Canal Boat to show the cabin accommodation; four sets of appliances for sterilization of Milk for domestic purposes; sections of Ball, Stop and Bib Valves; an apparatus for indicating CO_2 in air, and several specimens of Diseased Animal Tissues.

Twenty-two sets of Lantern Slides were lent on hire to members, and doubtless, when it is more widely known that these valuable helps for lecture purposes are available, the number of applications for them will increase.

The Museum is recognised by the Science and Art Department in connection with their Classes, and the Class Visits paid by Students to the Museum may be counted as a Class attendance for the purpose of the Examination Grant.

Personal Visits have been made to the Museum by representatives from Milan and Montreal, for the purpose of obtaining information for establishing or enlarging Museums at those places.

LIBRARY.

During the year there have been 600 readers. 447 volumes and pamphlets have been presented to the Library. Lists of these are published in Vol. XVII. of the Journal.

The Library contains, besides recent Text Books and Works on Hygiene and Sanitation, Extensive Sets of Parliamentary and other Official Reports, and Transactions of other Societies. The Council are always glad to receive recently published books on subjects relating to Hygiene, and these are reviewed or noticed from time to time in the Journal. They are also glad to receive old Official Reports, as they are frequently found useful in completing sets.

JOURNAL.

The Journal for 1896 will be found of more than usual interest. It contains the papers and discussions at the Congress at Newcastle, and among these, in addition to the technical papers of interest to experts, will be found others of a more elementary nature, which the Council believe will be of service to the Junior Associates and Students of the Institute.

The Council would mention that no remuneration is paid for the Articles, Reviews, or other Contributions to the Journal, nor to the members of the Committee who undertake the work of Editing.

FINANCE.

The Financial Statement for the year shows a very satisfactory balance of £580 12s. 2d. to the credit of the Institute on the year's working. This is the largest balance that has been carried forward since the Institute was founded, and is mainly due to the fact that the Examiners have conducted the Examinations throughout the year without receiving any fees.

It is also satisfactory to note that the Annual Subscriptions have increased by £150, and there is also a balance carried to the Revenue on the proceeds of the Congress and Exhibition.

Notwithstanding this increase in the Income of the Institute, the working expenses have remained stationary, showing that care and economy have been exercised in the organisation and management of the growing work of the Institute.

The Council in thus recording the work of a year so active and prosperous, desire to put on record their appreciation of the valuable services of their Secretary, Mr. E. White Wallis, which have largely contributed to this result.

EPITOME OF THE WORK OF THE INSTITUTE, 1896.

London Lectures and Examinations.

		Total Attendance.
4	Sessional Meetings for discussion of Sanitary subjects ..	424
36	Lectures to Sanitary Officers	2798
2	Special Demonstrations Inspection of Meat	153
36	Practical Demonstrations for Sanitary Officers	1046
3	Examinations in Practical Sanitary Science	61
2	Examinations Sanitary Inspectors	276
82	Classes brought to Museum	1435
	Other persons visiting Museum	17,000

Provincial Examinations.

8	Examinations Sanitary Inspectors and 1 Practical Sanitary Science	245

Provincial Congress and Exhibition.

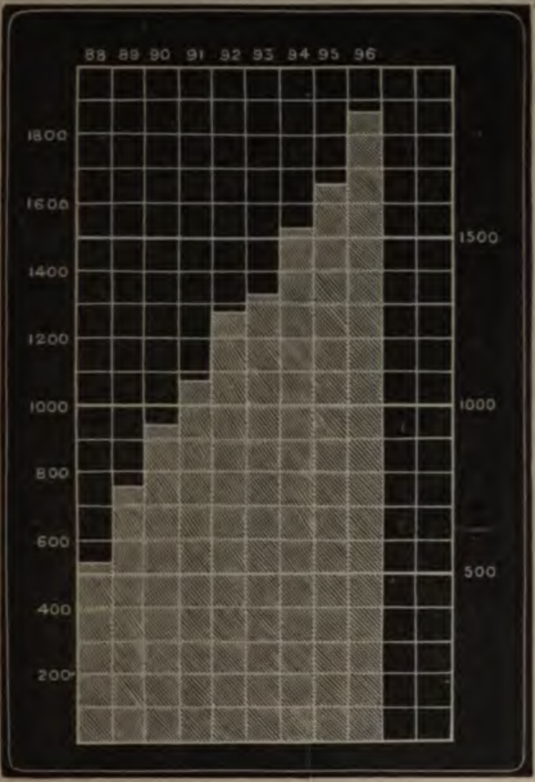
3	Sectional Meetings	366
5	Conferences	552
3	Addresses and Lectures	700
	Exhibition open for twenty-two days, at which a number of Lectures and Demonstrations were given	51,000

EPITOME OF REGISTERS OF MEMBERS AND ASSOCIATES.

The comparison of the roll of the Institute with the preceding year shows a steady increase in the number of Members and Associates.

	Hon. Fellows.	Fellows.	Members.	Associates.	Total.
Dec. 31st, 1895	28	151	573	913	1665
Dec. 31st, 1896	28	153	621	1064	1866

m showing the Yearly Increase in the Roll of the Institute.



OBITUARY.

vith much regret that the Council have to report the death . M. Humphry, m.d., f.r.s., Sir J. Russell Reynolds D., f.r.c.p., f.r.s., *Vice-Presidents.* R. W. Peregrine Birch .e., A. T. Brett, m.d., Sir Benjamin Ward Richardson, s., G. Shaw, *Fellows.* N. Dunscombe, assoc.m.inst.c.e., ric Erichsen, f.r.s., W. S. Green, J. McIntosh, A. an, J. Robinson, assoc.m.inst.c.e., T. W. Thompson, m.d., W. P. Buchan, J. M. Dawson, J. E. Holmes, W. , P. J. Roberts, T. D. Stewart, A. Sutcliffe, *Associates.*

A. WYNTER BLYTH,
Chairman of Council.

TE WALLIS,
Secretary.

24*th*, 1897.

STATEMENT of INCOME and EXPENDITURE

Dr,

Expenditure.	£	s.	d.	£	s.	d.
To Rent, Rates, Taxes, and Insurance	452	8	11			
,, Salaries and Wages	1,025	15	2			
,, Coals, Lighting, and Care of Offices.........	101	2	5			
,, Repairs, Alteration, and Arrangement of Museum	63	8	11			
,, Library, Binding, &c.	16	11	8			
,, Postage and Carriage	134	16	6			
,, Printing and Stationery	171	18	2			
,, Advertising	3	18	9			
,, Incidental Expenses	80	15	3			
,, Law Charges	8	15	10			
,, Office Furniture	2	13	9			
,, Depreciation of Leaseholds	75	0	0			
				2,137	5	4
To Journal and Publications, Cost of Printing, etc., less Sales and Advertisements	371	1	8			
,, Sessional Meetings	27	10	10			
,, Lectures, Sanitary Officers......................	264	8	3			
,, Examinations	581	4	0			
,, Congress	486	16	0			
,, Illustrated List of Premiated Exhibits ...	66	10	0			
				1,797	10	9
				3,934	16	1
,, Balance, Excess of Income over Expenditure for the year 1896, carried over				580	12	2
				£4,515	8	3

	£	s.	d.
Balance to be carried forward......	£9,555	19	7

Year ended 31st December, 1896.

Income.	£ s. d.	Cr. £ s. d.
l Subscriptions	1,257 10 6	
ace Fees	33 12 0	
rship Fees	36 15 0	
ion	1 1 0	
st on Investments, etc.	285 10 7	
		1,614 9 1
es, Sanitary Officers	354 19 1	
inations	2,002 7 10	
ations—Farr's and Simon's—Profit Sales	3 17 8	
ted List of Premiated Exhibits ...	6 15 6	
es	136 12 10	
tion	396 6 3	
		2,900 19 2
		£4,515 8 3

	£ s. d.
brought forward from last account (1895) ...	8,975 7 5
for the year 1896 brought down	580 12 2
	£9,555 19 7

STATEMENT OF INCOME & EXPENDITURE connected with Exhibition at Newcastle-upon-Tyne, 1896.

Dr. *Expenditure.*	£	s.	d.	Cr. *Income.*	£	s.	d.
To Printing, Postage, and Advertising	269	5	11	By Rent for Space	955	5	0
„ Catalogues and Programmes	117	6	0	„ Admissions	1,023	14	4
„ Bands and Entertainments	426	11	8	„ Catalogues and Programmes	223	11	11
„ Lectures and Demonstrations	90	5	6	„ Fees for Further Trials	46	10	0
„ Curator's Salary and Expenses	176	10	8	„ Gas and Water	34	15	1
„ Wages	108	15	3				
„ Incidental Expenses	90	8	3				
„ Buildings, Fittings, and Decorations	107	6	11				
„ Judging Expenses	298	5	3				
„ Gas and Water	36	9	10				
„ Grounds	166	4	10				
	1,887	10	1				
„ Balance	396	6	3				
	£2,283	16	4		£2,283	16	4

	£	s.	d.
ees and Subscriptions paid in advance for 1897	100	5	0
ife Composition Fund	273	0	0
ibrary Catalogue Account	98	2	9
undry Creditors	729	19	0
	1,201	6	9
alance of Assets over Liabilities	9,555	19	7
	£10,757	6	4

Assets.	£	s.	d.	£	s.	d.
By Leases of Premises, Library and Contents of Museum, Furniture and Publications.				1,885	16	1
„ Subscriptions in Arrear and Sundry Debtors				259	7	6
„ Cash in hand	409	7	9			
„ on Deposit	750	0	0			
				1,159	7	9
„ Investment in 2¾% Consols, Amount at December, 1895	8,248	11	1			
Less sold during year	590	0	0			
Balance	7,658	11	1			
Valued at Original Cost				7,452	15	0
				£10,757	6	4

Examined with the Books and Accounts and found correct,

Alfred Lass, Wood & Co., Chartered Accountants, } *Auditors.*
Magnus Ohren, Assoc.M.Inst.C.E.

MEETINGS HELD JANUARY TO MARCH, 1897.

ORDINARY GENERAL MEETING.

The Ordinary General Meeting was held on March 24th. The Annual Report and Statement of Accounts for 1896 were submitted. The report, which is published on page 115, gives an account of the various branches of work undertaken by the Institute.

The following Officers and Members of Council were elected or re-elected:—

As President.

H.R.H. THE DUKE OF CAMBRIDGE, K.G.

As Vice-Presidents.

HIS GRACE THE ARCHBISHOP OF CANTERBURY, P.C.
RIGHT HON. EARL FORTESCUE.
Sir F. ABEL, Bart., K.C.B., D.Sc., D.C.L., F.R.S.
Sir HENRY W. ACLAND, Bart., K.C.B., M.D., D.C.L., F.R.S.
Sir DOUGLAS GALTON, K.C.B., D.C.L., LL.D., F.R.S.
Sir W. GUYER HUNTER, K.C.M.G., M.D., Q.H.S., LL.D., F.R.C.P.
Sir FRANCIS SHARP POWELL, Bart., M.P.
Sir ROBERT RAWLINSON, K.C.B., M.Inst.C.E.
Sir HENRY THOMPSON, M.B.
Prof. W. H. CORFIELD, M.A., M.D.Oxon., F.R.C.P.
A. WATERHOUSE, R.A., LL.D., F.R.I.B.A.
THOMAS SALT.

As Members of Council.

BUSHELL ANNINGSON, M.A., M.D.
A. WYNTER BLYTH, M.R.C.S.
E. T. HALL, F.R.I.B.A.
H. LAW, M.Inst.C.E.
CHAS. MASON, Assoc.M.Inst.C.E., A.R.I.B.A.
J. W. PEGGS, Assoc.M.Inst.C.E.
GEORGE REID, M.D., D.P.H.
W. C. TYNDALE, M.Inst.C.E.

As Treasurer.

Sir DOUGLAS GALTON, K.C.B., D.C.L., LL.D., F.R.S.

As Auditors.

W. COLLINGRIDGE, M.A., M D., D.P.H.
ALFRED LASS, WOOD & Co.

URES AND DEMONSTRATIONS TO SANITARY OFFICERS.

Twenty-third London Course of 19 Lectures and 18 Practical
strations and Visits of Inspection to trade premises, Refuse
al Works, &c., commenced on February 15th. 64 Students
l their names for the Course.

n addition to the Course, the Council included the subjects
tory and Workshop Inspection, and the Construction and
ement of School Buildings.

SESSIONAL MEETINGS.

eeting was held on February 10th, when a discussion was
by F. J. Waldo, M.A., M.D., D.P.H., on "The Sanitary
sion of Shelters for the Homeless." Dr. R. Farquharson,
n the chair. About 58 Members, Associates, and Visitors
d.

March 10th a discussion was opened by Baldwin Latham,
C.E., on "Indian Sanitation." Sir William Guyer Hunter,
G., M.D., Q.H.S., LL.D., F.R.C.P., in the chair. About 150
s, Associates, and Visitors attended. Both the papers and
ns appear in this Journal, pp. 83 and 93.

EXAMINATIONS.

Examination in Practical Sanitary Science, held at Swansea,
uary 5th and 6th, 1897, One Candidate presented himself,
a Certificate in Practical Sanitary Science was granted:—

b. 6. Young, Robert, 7, Queen Street, Neath, Glamorganshire.

Examination for Inspectors of Nuisances, held at Swansea,
y and Saturday, February 5th and 6th, 1897, 29 Candidates
d themselves.

following 21 Candidates were certified, as regards their
Knowledge, competent to discharge the duties of Inspectors
nces:—

b. 6. Barnfield, Ernest William, 12, Ivor Street, Pontycymmer, S. Wales.
b. 6. Evans, David Lewis, 19, Richardson Street, Swansea.
b. 6. Evans, William Edward, 4, Plough Terrace, Port Talbot, S. Wales.
b. 6. Hale, George William, 17, Penmaen Terrace, Swansea.
b. 6. Holt, James, 5, Sandon Street, Liverpool.
b. 6. James, Samuel, Emlyn House, Vicarage Road, Morriston, Swansea.

1897, Feb. 6. JENKINS, WILLIAM HENRY, 26, Pembroke Road, Canton, Cardiff.
1897, Feb. 6. JONES, HENRY BOWEN, 114, St. Helen's Avenue, Swansea.
1897, Feb. 6. LEWIS, WILLIAM, 9, Thornhill Street, Canton, Cardiff.
1897, Feb. 6. MAKEPEACE, WILLIAM HENRY, Hatton, Warwick.
1897, Feb. 6. MORGAN, DANIEL, Glenview, Cwmgorse, Gwaun Coe, Gurwen.
1897, Feb. 6. MORGAN, DAVID W., 2, London Terrace, near Bonymaen, Swansea.
1897, Feb. 6. MORRIS, JAMES, 248, Waterloo Street, Bolton.
1897, Feb. 6. PRICE, DAVID, Upper Trostree, Talgarth, Brecon.
1897, Feb. 6. PRICE, MATTHEW DAVID, 54, High Street, Ferndale R.S.O.
1897, Feb. 6. SHIRTE, HENRY, Nant Melyn Reservoir, near Aberdare, S. Wales.
1897, Feb. 6. THOMAS, ABRAHAM, 49, Foxhole Road, near Swansea.
1897, Feb. 6. THOMAS, DAVID R., Llanerch Cottage, Gowerton.
1897, Feb. 6. THOMAS, MILTON MASON, 11, Bailey Street, Ton Pentre.
1897, Feb. 6. THOMAS, MORGAN, Glyn Cottage, Glynfach, Porth, R.S.O., Glamorgan.
1897, Feb. 6. WARNE, MAURICE CUTHBERT, Urban District Council Offices, Sidmouth.

Examination Questions.

Practical Sanitary Science. Swansea, February 5th and 6th.

PAPER I.

1.—What is the essential difference between an artesian and a surface well? What are the physical characteristics of water derived from different geological formations?

2.—How is rainfall calculated? How should a rain guage be constructed? What is the average rainfall in England? What is the ratio between rainfall and percolation through different strata?

3.—Explain the action of micro-organisms with reference to filtration of potable waters, and the purification of sewage.

4.—What is the minimum air space usually sanctioned for each person in the following places respectively; do you consider this amount sufficient?

Factories and Workshops;
Barracks;
Workmen's Dwellings;
Common Lodging Houses;
School Class Rooms.

What powers have a rural Sanitary authority to make By-Laws, respect to what nuisances are these limited? Can the Local ment Board increase these powers, and under what Act?

Paper II.

Vhat is the pressure per square inch at the bottom of a pipe 25 ft. high filled with water? Does the size of the ke any difference?

)raw sections to a scale of one inch to a foot of walls of the g materials:—

a) Stone rubble;
b) Stone and brick combined;
c) Brick built in English bond, one brick and a half thick;
d) Brick built in Flemish bond, one brick and a half thick;
e) Hollow brick wall.

ive a brief description of the various kinds of roofing tiles, ıd other roof coverings in general use.

ive a plan and describe the drainage of a 4-stall stable under ving conditions:—

ı) When the stable is 30 ft. from the main sewer;
)) When the stable is upon a clay soil 30 ft. from a stream which must not be polluted, and there is no system of sewers.

f you are called upon to report whether or not the newly-ınections of the drainage of a house with the sewer have perly made, in a town which has adopted the Model By-Laws ocal Government Board, to what points would you more ly direct your attention? Illustrate your answer by

The candidates were examined vivâ voce *on the 6th.*

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ors of Nuisances.—Swansea, February 5th and 6th, 1897.

hat powers has an Inspector to deal with nuisances arising

) Refuse from a dwelling;
) Defective drainage;
) Trade premises?

ite fully the powers and duties sanitary authorities have ard to the abatement of smoke under the several circum-ı which it may give rise to a nuisance.

3.—What are the signs apparent to the naked eye in the internal organs of animals suffering from Cattle Plague, Anthrax, Tubercle, Foot and Mouth Disease, and Flukes? How far do such diseases render the flesh of the animals unfit for food?

4.—A case of Small-pox is removed to hospital in a public conveyance. Where and under what conditions is this legal? What precautions would you subsequently take with regard to the conveyance?

5.—An inch of rain falls in the course of two hours uniformly upon a flat roof 100 ft. by 50 ft. How many gallons would be received on it per minute?

6.—Explain the advantages and disadvantages of the different materials of which cisterns are made. Describe the arrangement of overflows, and the supply to water-closets.

7.—A room 10 ft. high, 8 ft. wide and 20 ft. long, is occupied by two persons during a night of eight hours, and is ventilated by Tobin's tubes, the sections of which are 6 inches by 4 inches. How many cubic feet of air per hour should pass through the tubes in order to keep the air fresh and pure, and in what manner can the amount of air thus coming in be experimentally ascertained?

8.—Make a sketch showing in detail how you would arrange the drainage of a house having two water-closets, one on the ground floor, and the other on the first floor, also a bath and a sink on the first floor.

The Candidates were examined vivâ voce *on the 6th.*

At an Examination in Practical Sanitary Science and for Inspectors of Nuisances, held at Glasgow on Friday and Saturday, March 19th and 20th, 1897, one Candidate presented himself in Practical Sanitary Science, and 15 Candidates presented themselves for Inspectors of Nuisances.

The following Candidates were certified, as regards their Sanitary Knowledge, competent to discharge the duties of Inspectors of Nuisances:—

1897, Mar. 20. MACDONALD, KENNETH, 36, Newton Terrace, Ayr, N.B.
1897, Mar. 20. MCINNES, DONALD, Kilpatrick, Craignure Mull, N.B.
1897, Mar. 20. REID, JAMES, 184, Brandon Street, Motherwell, N.B.
1897, Mar. 20. RONALD, DAVID, Cauldhame, Falkirk, N.B.
1897, Mar. 20. WALKER, GEORGE UNDERWOOD, 2, Glebe Street, Saltcoats, N.B.

Examination Questions.

ctical Sanitary Science.—Glasgow, March 19th and 20th, 1897.

Paper I.

What is meant by the terms "Hydraulic mean depth"—"Head ssure"—"Specific gravity"—Capillarity"—" Absorption"?

Describe the principle of the barometer. To what height will ssure of air balance a column of water?

What power has a private individual to deal with a nuisance ous to health arising on or near his premises?

Give the normal composition of air. What is the limit of ic acid that should not be exceeded in the air of a living room? s this limit fixed?

A cubical tank the side of which is two feet is half filled with Find the pressure on one of the vertical sides and on the

Describe the manufacture of Portland cement, and its chief aristics.

Paper II.

What provisions would you suggest for stopping the damp enetrating through the basement walls and floor of a house s to be built on a damp soil, and with its floor 4 ft. below the of the ground? Illustrate your answer by a section.

Describe and illustrate by sketches the requirements of the By-Laws issued by the Local Government Board as to c drainage, the method of connecting drains with the public trapping and ventilation, including w.c.'s, sinks, baths, and drainage from roofs and yards.

n a country house where earth closets are in use what method ou recommend for dealing with the refuse and waste waters?

Describe the action that takes place in a sand or coke breeze ich causes the purification of polluted water or sewage that l through it.

The Candidates were examined vivâ voce *on the 20th.*

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ctors of Nuisances.—Glasgow, March 19th and 20th, 1897.

nder what conditions can pig-keeping be stopped? Where t be stopped in what way can it be regulated?

hat is the object of ventilation? Describe and sketch some for ventilating dwelling rooms.

escribe the steps that you would take as a Sanitary Inspector with a complaint of smoke nuisance from a factory.

inspecting a stream which is complained of as a nuisance, to what points would you direct your attention with the view to making a report?

5.—What are the chief characteristics of good drinking-water (both of hard and of soft)? Where water is stored in dwellings, what precautions have to be taken to preserve its purity?

6.—What power has a Local Authority to enforce the drainage of undrained houses, and to supervise and direct the execution of the work?

7.—Describe in detail the methods that should be adopted for the discharge of the waste and overflow from an ordinary bath and safe and from a lavatory basin, all in the same room, and their connection with the pipe conveying them to the house drain. Illustrate your answer by sketches.

8.—How many gallons of water would fill a 6-inch circular drain 90 ft. long, and if laid at an inclination of 1 in 30 what would be the pressure on a plug fixed in the lower end of the pipe?

The Candidates were examined vivâ voce *on the 20th.*

FORTHCOMING MEETINGS.

CALENDAR, APRIL TO JUNE, 1897.

As far as at present arranged.

Council Meetings are held Monthly on the Second Wednesday in each Month at 5 p.m.*

Finance Committee	Second Wednesday at 4.30 p.m.*
Exhibition Committee	First Tuesday at 5 p.m.
Congress and Editing Committee	Second Monday at 5.15 p.m.
Education Committee	Third Monday at 5 p.m.
Museum and Library Committee	Fourth Monday at 5 p.m.

APRIL.

1 T. Lecture to Sanitary Officers at 8 p.m. Principles of Calculating Areas, Cubic Spaces, &c.; Interpretations of Plans and Sections to Scale, by J. Wallace Peggs, ASSOC.M.INST.C.E.

3 S. Inspection and Demonstration at Aylesbury Dairy Co.'s premises, Bayswater (number limited), at 3 p.m.

5 M. Lecture to Sanitary Officers at 8 p.m. Sanitary Building Construction, by Prof. T. Roger Smith, F.R.I.B.A.

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* The Council and the Finance Committee will be held on the First Wednesdays in April and June.

Inspection and Demonstration at Chelsea Disinfecting Station, Lots Road, at 3 p.m. Conducted by Louis Parkes, M.D., D.P.H.

Inspection of the West London Paper Mill Company's Works, Fallopian Wharf, Lots Road, Chelsea, at 4 p.m.

Lecture to Sanitary Officers at 8 p.m. Details of Plumbers' Work, by J. Wright Clarke.

Public Meeting in Leeds relating to Congress and Exhibition.

Examinations in Practical Sanitary Science and for Inspectors of Nuisances, Birmingham.

Inspection and Demonstration at the Sewage and Destructor Works, Ealing, at 2.30 p.m. Conducted by Charles Jones, M.INST.C.E.

Extraordinary General Meeting of Members at 5 p.m.

Lecture to Sanitary Officers at 8 p.m. Sanitary Appliances, by George Reid, M.D., D.P.H.

Inspection and Demonstration at Artizans' Dwellings in Boundary Street Area, Bethnal Green, conducted by Owen Fleming, A.R.I.B.A.

Good Friday.

Easter Monday.

ecture to Sanitary Officers at 8 p.m. House Drainage, by W. C. Tyndale, M.INST.C.E.

nspection and Demonstration at Beddington Sewage Farm, Croydon. Conducted by Thos. Walker, M.INST.C.E.

ecture to Sanitary Officers at 8 p.m. Sewerage and Sewage Disposal, by Prof. Henry Robinson, M.INST.C.E.

nspection and Demonstration at the East London Waterworks, Lea Bridge, at 3 p.m. Conducted by W. B. Bryan, M.INST.C.E.

ecture to Sanitary Officers at 8 p.m. Scavenging: Disposal of House Refuse, by Charles Mason, ASSOC.M.INST.C.E., A.R.I.B.A.

MAY.

spection and Demonstration at Sewage Outfall Works, Barking. Conducted by Jno. Ed. Worth, M.INST.C.E.

xaminations in Practical Sanitary Science and for Inspectors of Nuisances, London.

JUNE.

xaminations in Practical Sanitary Science and for Inspectors of Nuisances, York.

JULY.

xaminations in Practical Sanitary Science and for Inspectors of Nuisances, Bristol.

CONGRESS AND EXHIBITION AT LEEDS.

utumn Congress and Exhibition of the Institute will be held in Leeds in September.

articulars of the arrangements will be included in Part II. of nal, July.

ouncil will be glad to receive as soon as possible any offers for reading at the meeting.

FELLOWS, MEMBERS, AND ASSOCIATES ELECTED.

From January to March, 1897, inclusive.

FELLOW (Fell. San. Inst.)

638 1897. Feb. Carritt, Ernest, F.S.I., A.R.I.B.A., 57, *Lincoln's-Inn-Fields, W.C.*

MEMBERS (Mem. San. Inst.)

† Passed Examination as Local Surveyor.
* Passed Examination in Practical Sanitary Science.
‡ Passed Examination as Inspector of Nuisances.

1032 1897. Feb. *‡Allan, George Awburn, Jr., 9, *Francis Street, Tottenham Court Road.*
1046 1897. Mar. *Beeson, Stephen Edward, *Church Street, Rickmansworth.*
1044 1897. Feb. *Berrington, Ernest, *Graiseley, Wolverhampton.*
1047 1897. Mar. Bicknell, Robert Henry, ASSOC.M.INST.C.E., 11, *Oppidans Road, N.W.*
1043 1897. Feb. Bowes, Arthur, ASSOC.M.INST.C.E., *Borough Engineer's Department, Town Hall, Salford.*
1031 1897. Jan. *‡Carter, Alfred, 181, *Wightman Rd., Harringay, N.*
1048 1897. Mar. †‡Davies, Llewellyn, 1, *Adelaide Place, Swansea.*
1049 1897. Mar. Dodgeon, Arthur, CERT.ASSOC.M.&C.E., 35, *Whalley Road, Clayton-le-Moors, Lancashire.*
1033 1897. Feb. *‡Endsor, Henry Arthur, *Yardley Gobion, Stony Stratford, Bucks.*
1027 1897. Jan. Green, Reginald, M.D., B.HY., M.O.H., *Town Hall, Gateshead.*
1050 1897. Mar. *Higlett, Harry Shepard, 68, *Woodbridge Road, Guildford.*
1035 1897. Feb. Hindle, Arthur, ASSOC.M.INST.C.E., 10, *Richmond Terrace, Blackburn.*
1034 1897. Feb. *Hobday, Frederick Thomas George, M.R.C.V.S., *Royal Veterinary College, Camden Town, N.W.*
1036 1897. Feb. *Lloyd-Davies, David Ernest, *Wyre Court, Bewdley, Worcester.*
1037 1897. Feb. MacBrair, Robert Alexander, ASSOC.M.INST.C.E., *City Engineer, Lincoln.*
1051 1897. Mar. Mapleton, Henry B., M.D. (EDIN.), D.P.H. (LOND.), *Womwell, Highweek, Newton Abbot, Devon.*
1038 1897. Feb. *Mayell, Alfred Young, *The Bush Hotel, Pembroke Dock, S. Wales.*
1040 1897. Feb. *Mead, Charles Henry, 7, *Peak Hill Gardens, Sydenham, S.E.*
1025 1897. Jan. Millson, George, M.R.C.S., L.R.C.P.LOND., M.O.H., 169, *Kennington Park Road, S.E.*
1026 1897 Jan. †Milnes, George Percival, ASSOC.M.INST.C.E, *Engineer and Surveyor to the Stroud Urban District Council, Stroud, Gloucestershire.*

Mar. OBELT, Theodorus Van Heemstede, 150, *de Ruyterkade, Amsterdam, Holland.*

Jan. REUNERT, Theodore, ASSOC.M.INST.C.E., M.INST.M.E., *Johannesburg, S. Africa.*

Feb. *SMITH, George Henry, *Brooklands, New Malden, Surrey.*

Mar. *‡SMITH, John Buckingham, 7, *St. John's Road, Upper Holloway, N.*

Jan. SQUANCE, Thomas Coke, M.D., M.S., L.S.SC., F.R.M.S., F.C.S., F.R.MET.SOC., 15, *Grange Crescent, Sunderland.*

Mar. *STRANGE, E. Jeffery, 34, *London Road, Tunbridge Wells.*

Feb. *SUTCLIFFE, George Lister, *Heptonstall, viâ Manchester.*

Feb. *‡SWITZER, Sydney A., 9, *Derby Street, Grays Inn Road, W.C.*

Jan. THOMAS, Daniel Lewis, M.R.C.S., L.R.C.P., D.P.H., 252, *Mile End Road, E.*

Feb. *‡WARREN, Archibald Ralph, 73, *Breakspears Road, St. Johns, S.E.*

Mar. WHITAKER, Edmund Thomas, B.SC. (PUB. HEALTH) (EDIN.), D.P.H. (CAMB.), ASSIST. M.O.H., *Ashleigh, Bellevue, Shrewsbury.*

ASSOCIATES (ASSOC. SAN. INST.)

‡ Passed Examination as Inspector of Nuisances.

Feb. ‡ALLAN, Lewis Forsyth, "*Chirbury*," *New Southgate, N.*

Feb. ‡APPS, Harry Mason, *West Malling, Kent.*

Feb. ‡BAKER, Arthur, 8, *Caldecote Street, Newport Pagnell, Bucks.*

Feb. ‡BARNES, Thomas J., 43, *Coopersale Road, Homerton, N.E.*

Feb. ‡BARTLETT, James, 42, *Paulin St., Bermondsey, S.E.*

Feb. ‡BELLAMY, Herbert Ernest, 66, *Chapel Street, St. Helens, Lancashire.*

Jan. ‡BOULD, William, 8, *Albion Street, Penkhull, Stoke-on-Trent.*

Mar. ‡BOWKER, Walter Stanley, 22, *Shakespeare Crescent, Patricroft, Lancaster.*

Mar. ‡BRAITHWAITE, Thomas, *Leighton Buzzard.*

Mar. ‡BRANCH, Thomas Anderson, *Kirkcaldy Villa, Hazelhurst Road, Tooting.*

Feb. ‡CANNELL, Arthur Edward, *Lower Hellesdon, Norwich.*

Mar. ‡CARTER, Rowland Wilfred William, *Scarning, East Dereham, Norfolk.*

Mar. ‡CHARLESWORTH, Reeves, 99, *Beechwood Road, Hillsboro', Sheffield.*

1510 1897. Feb. ‡Cheetham, Albert, 6, *Wallace Road*, *Canonbury*, *N.*

1511 1897. Feb. ‡Collier, Albert, 23, *Culcheth Lane*, *Newton Heath*, *Manchester*.

1513 1897. Feb. ‡Connor, Mrs. Emma Laura, 2, *Park Row*, *Greenwich*, *S.E.*

1498 1897. Feb. ‡Cornwell, Frederick Hoadley, 3, *Canonbury Park*, *N.*

1485 1897. Jan. Cosson, James, 118, *Ippley Road*, *Hammersmith*.

1538 1897. Mar. ‡Crane, William Henry, 5, *Colonial Street*, *Hull*.

1514 1897. Feb. ‡Cromwell, Edwin Oliver, 41, *Horsford Road*, *Brixton Hill*, *S.W.*

1490 1897. Jan. ‡Dobson, Miss Œnone, *Glenaradale*, *North Finchley*.

1515 1897. Feb. ‡Ellwood, Jason, *Ewbank View*, *Kirkby Stephen*, *Westmoreland*.

1516 1897. Feb. ‡Fothergill, James Edward, 8, *Cross Mount Street*, *Warwick Road*, *Batley*.

1532 1897. Feb. ‡Frost, Charles Edwin, 135, *High Street*, *Lewisham*, *S.E.*

1518 1897. Feb. ‡Graham, Thomas, 20, *Alfred Road*, *Birkenhead*.

1517 1897. Feb. ‡Grimsley, John, 25, *Algernon Road*, *Birmingham*.

1530 1897. Mar. ‡Hale, Edward John, 17, *Coleridge Road*, *Crouch End*, *N.*

1540 1897. Mar. ‡Halstead, Bannister, 51, *Crowther Street*, *Burnley*.

1537 1897. Mar. ‡Harlock, Miss Gulielma, *Finedon*, *Northampton*.

1499 1897. Feb. ‡Harmer, John, 7, *Drummond Road*, *Croydon*.

1494 1897. Feb. ‡Harmer, Walter Sydney, 163, *Oval Road*, *E. Croydon*.

1541 1897. Mar. ‡Harrison, John William, 5, *Dracup Road*, *Bradford*.

1542 1897. Mar. ‡Heasman, Albert George, 3, *Ardmere Cottages*, *Hither Green*, *S.E.*

1519 1897. Feb. ‡Hemmann, Fritz, 10, *Bordyke*, *Tonbridge*.

1500 1897. Feb. ‡Hindes, Edward Johnson, *Station Road*, *Beccles*.

1501 1897. Feb. ‡Hogg, Edwin Heckley, *Cold Harbour*, *Nash*, *near Newport*, *Mon.*

1543 1897. Mar. ‡Hughes, Alfred, 24, *Egerton Road*, *New Ferry*.

1545 1897. Mar. ‡Hull, Richard Norris, 17, *Carlton Street*, *Preston*.

1487 1897. Jan. Irvin, Charles, *Port Sanitary Inspector*, *Mill Dam*, *South Shields*.

1520 1897. Feb. ‡Jackson, Frederick William, *Bollington*, *near Macclesfield*.

1482 1897. Jan. Jenkins, Arthur Rogers, 357, *West Street*, *Durban* (*Johannesburg*).

1546 1897. Mar. ‡Jump, Richard, 9, *Belford Street*, *Burnley*.

1523 1897. Feb. ‡Kelly, James Francis, "*Brooklyn*," *Dagnan Road*, *Balham Hill*, *S.W.*

1502 1897. Feb. ‡Linch, David William, 45, *Kingsdown Road*, *Leytonstone*, *N.E.*

1481 1897. Jan. Maddox, Arnold G., 184, *Malpas Road*, *S.E.*

1524 1897. Feb. ‡Martindale, Miss Hilda, 5m, *Hyde Park Mansions*, *N.W.*

7. Feb. ‡MATTHEWS, Douglas Samuel, 345, *Fulham Road, S.W.*

7. Feb. ‡MAY, James Henry, 7, *Fox Street, Stockport.*

7. Feb. ‡MONSON, Harold Rudolph, 21, *Alexandra Road, Newland, Hull, Yorks.*

7. Jan. ‡MORGAN, Arthur Cecil, 37, *Cornwall Rd., Bayswater.*

7. Feb. ‡NASH, Frederick, 349, *Wandsworth Road, S.W.*

7. Feb. ‡NEIGHBOUR, Herbert, 23, *Dalling Road, Hammersmith, W.*

7. Mar. ‡NORMAN, George T., 8, *Shaftesbury Road, Richmond, Surrey.*

7. Jan. OATLEY, Henry, 1, *Adie Road, Hammersmith.*

7. Feb. ‡ODLUM, Walter Edward, *Grand Hotel, Dover.*

7. Feb. ‡PERKINS, Walter Philip, *Milsington Villas*, 44, *Monson Road, Redhill.*

7. Mar. ‡PICKERING, Thomas Farmer, 22, *Alma Street, Wolverhampton.*

. Mar. ‡POWELL, Arthur Ernest, 13, *Listria Park, Stoke Newington, N.*

. Feb. ‡RANSOM, Miss Dora Mildred, 10, *Blomfield Street, Paddington.*

. Feb. ‡REILLY, George, 68, *Thornhill Road, Barnsbury, N.*

. Feb. ‡SANDERS, Herbert W., 92, *Crawford Street, Bryanston Square, W.*

. Feb. ‡SIBLEY, Miss S. Jane, *Cuxton, Kent.*

. Feb. ‡SHAW, Arthur James, 58, *Teviot Street, South Bromley, E.*

. Feb. ‡SMITH, Alfred, 97, *Linaker Street, Southport, Lancaster.*

. Mar. ‡STOVOLD, Frank, 112, *Keppel Street, Chelsea, S.W.*

. Feb. ‡SWAIN, Walter, 2A, *Mount Street, Rochdale, Lancashire.*

. Feb. ‡TAYLOR, William Wells, 48, *Burnfoot Avenue, Munster Road, Fulham, S.W.*

, Mar. ‡TEEBAY, Miss Alice, *Purston Vicarage, Pontefract.*

, Feb. ‡THORNHILL, George Edwin, *Christchurch Infirmary, Blackfriars, S.E.*

, Jan. ‡TRACEY, Miss Ann, 29, *St. Stephen's Mansions, Westminster, S.W.*

, Jan. WATERS, Daniel, *Sanitary Inspector, Alnwick.*

Jan. WEEDEN, Charles F., 68, *Richford Street, Hammersmith.*

Mar. ‡WESTGARTH, George Wilkinson, *Healy Hill Colliery, Durham.*

Jan. ‡WILSON, Jason Charles, 72, *Margaret Street, Regent Street, W.*

Mar. ‡WINDRED, Albert, 7, *Dixon Road, New Cross, S.E.*

Mar. ‡WOOD, Alexander, *Ashington, Morpeth.*

Mar. ‡YORKE, Thomas, *Washbrook Road, Rushden, Northampton.*

OBITUARY.

SIR SPENCER WELLS, BART., F.R.C.S.

(MEMBER.)

The death, at the age of 78, of Sir Spencer Wells, Bart., F.R.C.S., deprives The Sanitary Institute of a distinguished Member and warm supporter. Born in 1818, some of the earlier years of his professional life were spent in the Royal Navy, and during the Crimean War he had charge of the Auxiliary Hospitals at Smyrna and Renkioi. Here it was, probably, that he was thrown into contact with Edmund Alexander Parkes, and this fact, combined with the circumstance that he was a witness of the horrors which result from treating the wounded in insanitary buildings, served to impress upon him the prime importance of Hygiene in relation to Medical and Surgical practice. Spencer Wells may fairly be regarded as one of the pioneers of the sanitary advance, which has been perhaps the most important of the many advances which the English people have made in the Victorian era.

Sir Spencer Wells was President of the Congress of the Institute held at York in 1886, and served as Chairman of the Reception Committee during the International Congress of 1891.

His reputation was made mainly as a Surgical Specialist, and his name will be inseparably linked for ever with the operation of ovariotomy and with abdominal surgery generally. These operations were considered so dangerous, and the mortality from them was so great, that the early advocates and practisers of them were branded occasionally as murderers. The perfection of detail, mainly due to Spencer Wells, and the subsequent application to them of the principles of Asepticism, have deprived these operations of all their terrors, and have reduced the mortality to something very small indeed.

Spencer Wells and Lister have shown that what was known as "Hospitalism" was due to faulty wound treatment; and that which was not to be conquered by the most reckless and quixotic expenditure on the construction of hospitals has become a thing of the past in the presence of antiseptic principles.

Spencer Wells was a strong advocate of "Cremation," and in conjunction with the late Mr. Eassie and Sir Henry Thompson was largely instrumental in establishing the Crematorium at Woking.

Sir Spencer Wells died at the Cap d'Antibes in the South of France on January 31st. His body was brought home to this country to be Cremated. G. V. P.

EXHIBITS ADDED TO THE MUSEUM.

JANUARY—MARCH, 1897.

DIVISION A.

Science in Relation to Hygiene.

Air Testing Apparatus, for indicating the amount of CO_2 by comparison. (Scurfield's Patent.) *J. Defries & Sons.*

Geological Strata. Specimens of Sand, Gravel, Clay, &c., taken from various parts of London at ascertained depths to illustrate the strata of the London Basin.

Vaccination and Variolation. A series of 15 Coloured Plates by Kirtland; illustrating daily comparisons. From the "British Medical Journal."

Anemometer (Biram's Patent), reading to ten million feet, for measuring the Velocity of Air in Tubes, Flues, &c. *Purchased.*

DIVISION C.

Construction and Sanitary Apparatus.

Sanitum Wall Papers. Book of Designs. *Walker & Carver.*

Ball-Valve, Stop-Valve, Bib-Valve. Sections showing the various parts. *J. Tylor & Sons.*

Combination Closet (Shanks' Patent), with Cistern immediately above the Seat of Closet for positions where only a small head of water cannot be obtained. *Shanks & Co.*

Sewer Construction. Full Size Section of Sewer with side inlet; built from drawing and specification prepared by A. R. Binnie, M.Inst.C.E.

Stoneware Drain Pipe, damaged by the action of water and sand. The water escaping from a high-pressure main in a sandy soil drove the sand with sufficient force to wear away and nearly perforate in several places a 6-inch Stoneware Pipe. *Rogers Field, M.Inst.C.E.*

Barron's Channel Bends made to pass Drain Plug. Straight and curved. *William Harriman & Co.*

Lead Trap, damaged by an iron brad in fixing the floor near the trap. *Rogers Field, M.Inst.C.E.*

Oyster Culture in Relation to Disease. Several plates and town plans, showing various Bacteriological Cultivations, and the relations of Oyster Beds to Sewage outfalls. From the Twenty-fourth Annual Report of the Local Government Board.

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S ON LEGISLATION AND LAW CASES.

Prepared by A. Wynter Blyth, Barrister-at-Law.

CHANCERY DIVISION.

Before Mr. Justice Stirling.

(*Times, Nov. 4th.*, 1896.)

ATTORNEY-GENERAL *v.* MAYOR, &C., OF PRESTON.

ctrine applied to private nuisances, that if the occurrences are ı and occasional the Court will not interfere, applied to isances.

ras an action brought by the Attorney-General at the f the Rural District Council of Preston against the Mayor, ., and Burgesses of the County Borough of Preston and a ıp, the tenant of the Borough Sewage Farm, seeking to :he defendants from receiving, treating, or distributing n a farm called Freckleton Farm so as to cause a public Freckleton Farm contained 557 acres and is situated four miles from Preston on the north side of the River ı which it has a frontage of nearly a mile. The district of ors was on the south side of the river and was in part :ly opposite the farm. In 1889 an inquiry was held by the vernment Board as the result of which the Corporation orized to borrow a sum of £83,000 for the purpose of for conveying the sewage of the borough to Freckleton be there disposed of; and subsequently a further sum of or the purpose of adapting the farm to be used as a sewage ith these sums of money have been raised by the Corporation d by them for the purposes above mentioned. The sewage ı was first turned into the farm in August 1893, and has ever since to be so dealt with. In 1894 complaints began e by persons living within the district of the relators that sit of sewage was causing a nuisance, and, after some lence between the complainants and the Town Clerk of this action was commenced on March 28th 1895. The lid not complain of the violation of any specific statutory enactments, but they contended that the defendants were not entitled to dispose of the sewage of Preston in such a way as to cause a public nuisance. The defendants denied that they had so acted as to call for the interposition of the Court by way of injunction.

Mr. Hastings, Q.C., Mr. Macmorran, Q.C., and Mr. Sutton appeared for the plantiffs; and Mr. Cozens-Hardy, Q.C., and Mr. Danckwerts for the defendants.

MR. JUSTICE STIRLING, in giving judgment, said that no case of injury to property was alleged, but it was said that the acts of the defendants caused injury or danger to the health of the inhabitants of the plaintiff's district, or, at all events, seriously affected their comfort. After dealing with the evidence on these points he came to the conclusion that no case of injury to health was made out, and that there had not been any such interference with comfort as to entitle the plaintiffs to an injunction. In his opinion, however, it was established that down to the commencement of the action and for some time subsequently the defendants had adopted a mode of dealing with the sewage which was likely to cause nuisance. He could not doubt that in the autumn of 1894 the smells caused considerable discomfort to some people in the enjoyment of their houses, but the evidence showed that during the years of 1895 and 1896 this interference with comfort had been much less serious than in 1894, and from whatever source it might have proceeded, it had not during those years exceeded that which was frequently caused by some very ordinary agricultural operations. The law as to the granting of injunctions in cases of nuisance was concisely stated by Lord Justice Turner in "Swaine *v.* Great Northern Railway Company" (4 De G. J. and S., 211) in these terms:—"Occurrences of nuisance, if temporary and occasional only, are not grounds for the interference of the Court by injunction except in extreme cases." That was a case of private nuisance, but the same doctrine was applied to public nuisances in the case of "A. G. *v.* Sheffield Gas Company" (3 D. M. and G., 304) and "A. G. *v.* Cambridge Gas Company" (L. R. 4, Ch. App., 71). The present case was brought within that principle, and consequently the action must be dismissed; but, having regard to all the circumstances of the case, it would be dismissed without costs.

QUEEN'S BENCH DIVISION.

Before JUSTICES GRANTHAM and WRIGHT.

FOWLE *v.* FOWLE.

(75 *L. T.* Rep., 514.

Sale of Food and Drugs Act, 1875 (38 & 39 *Vict., Sect.* 6, *c.* 63). *In a particular case it may be a question of fact whether a substance is a drug or not. In this case the beeswax was sold by a grocer and not by a pharmaceutical chemist, and it was held that beeswax so sold was not a drug.*

This case was stated by the Justices of Cranbrook.

Respondent was charged under Sect. 6 of the Sale of Food
ugs Act, 1875, with having sold to the prejudice of the
er a drug, viz. beeswax, which was not of the nature, sub-
ind quality of the article demanded. The Respondent was a
it Marden, in Kent. The Appellant bought from the
lent a pound of beeswax, which beeswax was found to be
ted with paraffin to the extent of 50 per cent. The Justices
t the beeswax was not a drug within the meaning of the
and dismissed the summons.

ıspector appealed.

USTICE GRANTHAM: In my judgment the magistrates were
. am not prepared to admit that beeswax as sold by a grocer
ı drug, although possibly by going through dictionaries a
ı might be found of the word "drug" which would include
The article was sold by a grocer who buys and does not
The principal use of beeswax used to be to polish tables,
be ever used as is contended in the preparation of medicines,
most of its uses are not medicinal.

USTICE WRIGHT: I am of the same opinion, and I rest my
on the ground that it may be a question of fact whether in
ar case an article is a drug, and the Justices have rightly
ıat in this case beeswax is not. Take the case of turpentine
oth of which are used in the preparation of medicines. But
ld for use on the bow of a fiddle would not be a drug. Far
ortant is the question whether the seller would escape
y informing the buyer that the article was not pure. I do
that now, but I may say that this case is not like Sandys
3 Q. B. Div., 449).

Before JUSTICES WILLS and WRIGHT.

COLMAN *v.* MILLS.

(75 *L. T.* Rep., 590.)

*Health (London) Act. Power to make Bye-laws. Under a
power to make Bye-laws for "regulating the conduct of any
ecified," among which was the business of a slaughterer of
ye-law provided that "An occupier of a slaughter-house* (a)
*laughter or permit to be slaughtered any animal .... in any
e premises except the slaughter-house;* (c) *shall not slaughter
to be slaughtered any animal within public view or within the
ny other animal." Held that these Bye-laws were properly
were valid, nothwithstanding that they prohibited acts not
by the statute, and that upon the proper construction of the
"slaughtering" meant slaughtering either by the master
by his servant, so as to render the master liable to the
for acts done by his servant in the course of the business,
master's knowledge, and against his instructions.*

s a case stated by Mr. Sheil, Metropolitan Magistrate.

spondent was summoned on behalf of the L.C.C. on two summonses—the one for slaughtering animals in the pound and not in the slaughter-house, the other for slaughtering sheep within the view of other sheep, both acts contrary to the following Bye-laws:—"An occupier of a slaughter-house (*a*) shall not slaughter or permit to be slaughtered any animal in any pound, pen, or lair, or in any part of the premises except the slaughter-house; (*c*) shall not slaughter or permit to be slaughtered any animal within public view, or within the view of any other animal."

The Bye-law was made under Sect. 19 of the Public Health (London) Act, 1891.

It was proved or admitted that two sheep were slaughtered in the pound, and not in the slaughter-house, and in view of other sheep; and that such slaughtering was done by one Brigden, who was foreman and slaughterman in the employ of the Respondent. The Respondent was absent at the time, and had forbidden his servants to do the acts complained of, or either of them.

The magistrate found that the acts complained of were done without the knowledge of the Respondent. He referred the Court to "Somerset *v.* Wade," 70 *L. T.* R. 452 (1894), 1.Q.B. 574.

The arguments in the case will sufficiently be gathered from the abstract of the judgment:—

MR. JUSTICE WILLS: The case may be disposed of in consonance with the established principles of common law and of the law applicable to bye-laws, and yet we may hold, as I am prepared to do, that the offence has been committed in this particular case. The objection that has been taken would be, I think, well founded, and a good objection in itself, if it applied properly to the present case. It is as I understand it this, that by the common law of England a man is not, generally speaking, responsible criminally for the things which are done by his servants without his knowledge; that this is a crime, and therefore by the common law of England a man who knows nothing of what has been done cannot be responsible for penalties in the case; that a bye-law must not be repugnant to the common law of England, unless of course it is within the express powers given by the Act of Parliament, under which the bye-laws are made; and therefore when you are dealing with a bye-law you cannot say, as also as you can always say in the case of an Act of Parliament, Parliament has constituted that an offence, and a criminal offence, which would not by the common law of England be a criminal offence, and as Parliament is supreme it does not matter that it is a violation of the ordinary principles of the common law—it is the will of Parliament, and the courts must give effect to it—but you must say that where the bye-law is made it must be generally consonant with English law and that if it violates that principle it is a bad bye-law. Therefore it is argued, if there are two constructions to a bye-law, one of which will make it a bad bye-law, and the other will not make it a bad bye-law, we must adopt the one—although it would not otherwise be a natural one to adopt—which makes it consonant with the law of England; and on this ground it was argued, that this expression "shall not slaughter"

› be construed in a different way to that which in the words
iot sell" are construed in the licensing Acts with reference
enalties affixed to the offence. That is the argument for the
lent and it seems to me it would be sound except for this,
se bye-laws are made under the statutory power to regulate
uct of the business. These are wide words, and we must
er, when we are dealing with these matters of bye-laws and
and creating offences, that there is a distinction which has
quently drawn between things which are criminal in them-
iings which are morally wrong and wicked, and things which
criminal and prohibited by penalties because the prohibition
is for the public good. In the latter case a greater latitude
onably be allowed in dealing with a bye-law made for such
, than if the bye-law were one which was not dealing with
icular class or category of cases. That is a distinction
out long ago by Mr. Justice Lush in the case of Davies v.
30 *L. T.* Rep., 629). I think, apart from this, that this
make bye-laws for the conduct of a business is wide enough
statutory authority to make such a bye-law as this, and
uch legislation as this. If this bye-law had said in terms
usiness shall be so carried on and so conducted (which is
eology of the Act) that "no animal shall be slaughtered in
ther animals," then I should agree in thinking that that
ould be a perfectly good bye-law; and I do not think that
law does anything more, really, than say that in other
therefore think that it is in the power of the County
› make bye-laws such as these for regulating the conduct of
ss. If it is within that power then there is no reason why
ould not receive its natural construction so as to include
f the servant. I say its natural construction for this reason,
s been pointed out in some of the cases, and is, in fact,
ous, that in businesses of this kind, which are very often
on a very extensive scale, and which must be carried on
ployment of numerous servants, the legislation becomes
e and practically useless, if the application of it is confined
'ants, and if the master is not rendered liable as well. It
ne, looking at what a slaughter-house is, and bearing in
fact that one man probably employs dozens of servants to
hings, that it would be a very poor protection that would
d if slaughtering did not mean slaughtering either by
by his servants, as I am of opinion that to make such a
this was, notwithstanding its being generally repugnant
of England, within this power of making bye-laws to
he conduct of the business, and to fix penalties for the
bye-laws so made under that power. I think in this case
n of the magistrate should be reversed, and the case ought
to him for conviction.

STICE WRIGHT concurred.

allowed with costs, and case remitted to the magistrate.

GENERAL NOTES.

Translation of M. Pasteur's Body.—At the request of the Council of The Sanitary Institute, Dr. Reid, as representing the Institute, attended the ceremony of the translation of the body of M. Pasteur from Notre-Dame to the Pasteur Institute, which took place on the morning of December 26th, 1896.

Some hundreds of representatives of public bodies and scientific societies, together with a number of friends of the deceased, met in the library of the Institute in the Rue Dutot, to await the arrival of the body from the Cathedral, where a requiem mass, at which the family and a few personal friends only were present, was said by the Abbé Rocelle.

England was represented at the ceremony by Lord Lister (then Sir Joseph), Sir John Evans, Sir W. Priestley, Sir Dyce Duckworth, Prof. Crookshank, and Dr. G. Reid, all of whom spoke after the consecration ceremony, on behalf of the public bodies they represented. Among others who were present in an official capacity may be mentioned Général Tournier and Commandant Moreau, representing the President of the Republic, MM. Loubet and Brisson, Presidents of the Senate and the Chamber of Deputies, M. Méline, President of the Council, M. Rambaud, Minister of Instruction, and numerous representatives of Universities and learned Societies in France and other countries.

On the arrival of the body from the Cathedral a procession was formed, and the coffin was carried to the crypt.

The English delegates were received with considerable distinction, and were given the first place in the procession immediately following the family. They thus had the privilege of being among the select few who witnessed the consecration service within the crypt, a privilege which, owing to want of space, was denied to the majority.

The procession was formed in the following order: the family, the English delegates, the representatives of the President of the Republic and the Minister of War, the President of the Council, the Chief of the Cabinet, the Minister of the Interior, and other Ministers and officials, followed by the various delegates of Universities and learned Societies in France and other countries.

The crypt is situated at the end of the central corridor of the Institute, opposite the principal entrance. It is screened from the corridor by handsome wrought-iron gates, and is approached by a flight of white marble steps. The floor is of white marble, and the walls and dome-shaped roof are of Roman Mosaic, numerous panels are introduced illustrating Pasteur's principal works, each panel bearing an appropriate inscription. Opposite the gates is an altar, and in the centre of the crypt is the massive black marble tomb.

The consecration service was conducted by Bishop Pousset, and after the service M. J. B. Pasteur, addressing himself to M. Jos. Bertrand, President of the Council of the Institute, handed over the tomb to the Institute in the name of the Pasteur family. The procession then filed through the crypt, and afterwards assembled in the corridor, where, from a small tribune, the various orations were delivered.

The ceremony, which was most impressive throughout, lasted about an hour and a half, and before leaving the Institute a few of the delegates were received by the Pasteur family.

G. R.

IATIONAL SANITARY CONFERENCE. --The International Sanitary ce was held at Venice, principally to consider the measures to be for preventing the spread of Bubonic Plague. There were sixty- gates, England being represented by Dr. R. Thorne Thorne and I. J. Lane Notter, M.A., M.D., who are Fellows of The Sanitary ; the Hon. Michael Herbert and Mr. Farnell. The first sitting of rence was held on February 16th, and the Convention was signed ibours of the Conference brought to a conclusion on March 19th. nvention was signed without reservations by the representatives of ungary, Belgium, France, Great Britain, Italy, Luxemburg, Mon- Holland, and Roumania. It was signed *ad referendum* by the itives of Spain, Greece, Persia, Portugal, Servia, and Turkey. presentatives of Germany signed, with reservations relative to ecautionary measures to be taken in Europe. The Swiss represen- ned for the measures to be taken in Europe.

resentatives of Denmark, Sweden and Norway, and the United pted the Convention *ad referendum*, declaring that their respective nts would apply as far as possible the measures laid down before ted for the ratification of the Convention. The representatives of Austria-Hungary, France, Great Britain, Italy, Luxemburg, o, Holland, Portugal, Roumania, Russia, and Switzerland drew owing proposals to be addressed to their respective Governments:—

To communicate to the Tangier Sanitary Board the decisions of the Venice Sanitary Convention in order that the measures adopted may be applied in Morocco, notably the prohibition or temporary limitation of pilgrimages.

The unification of prophylactic measures by the authorities of Malta and Gibraltar.

'he co-ordination and codification as soon as possible of all the recommendations of previous Conferences against cholera and plague.

to the Convention is a general sanitary regulation concerning ve measures. It consists of five paragraphs, and in it the period m of plague is taken as ten days.

OMMISSION ON TUBERCULOSIS.—Two Sittings of this Com- re held recently at 7, Whitehall Place, Sir Herbert Maxwell, in the chair. The other Commissioners present were Dr. R orne, Professor G. T. Brown, Mr. Shirley F. Murphy, Mr. T. ch, and Mr. J. Speir. The evidence was heard of three of those y the Cattle Diseases Committee of the Central and Associated f Agriculture—namely, Mr. B. St. John Ackers (Chairman), of hire; Mr. T. Carrington Smith, of Staffordshire; and Mr. J. ncashire. The evidence of the witnesses had reference, among , to the nature of the disease, its extent in various herds of cattle, ss inflicted upon dairy farmers and agriculturists generally by its The view was expressed that a stamping-out process, such as actised in the case of cattle plague, foot-and-mouth disease, and monia, was not applicable to tuberculosis, but that compensation given to the owners of animals which when living were appara- ly, but which after slaughter were condemned and confiscated in of the public health by reason of the presence of the disease.— l 3rd, 1897.

DR. W. COLLINGRIDGE ON QUARANTINE.—The first of the Milroy L was delivered at the Royal College of Physicians by Dr. William C ridge, Medical Officer of Health for the Port of London, the subject "Quarantine." After a tribute to the valuable work done by Dr. Milroy (the founder of the lectures) in endeavouring to abolish t and oppressive system of quarantine, the lecturer said that for generations the history of quarantine afforded an example of a fier bitter struggle between two great interests – those of public health and The advance of modern science had shown that these interests, so fa being antagonistic, could best be served by one and the same system. abolition of quarantine and the substitution of a rational system of n inspection had become possible in this country only because our polic been for many years to expend money on the improvement of the sa condition of the people, and thus to deprive disease of a congenial h The only practical way to preserve the health of a country was to in its sanitary condition by means of systems of pure water supply, sew and rational treatment of infectious disease. In a commercial count England, quarantine had proved not only useless, but actually impo while experience had shown in other countries that the cost of qua was so enormous that it had exhausted the resources of the people, wh therefore been unable to carry out effective systems of sanitation. same time, it engendered a feeling of confidence for which there foundation.

XVIII.—Part II.] [JULY, 1897.

JOURNAL
OF
E SANITARY INSTITUTE.

'HE NOTIFICATION OF MEASLES.

IRY KENWOOD, M.B., D.P.H., F.C.S., Medical Officer of Health, Stoke Newington and Finchley.

(FELLOW.)

Read at Sessional Meeting, April 7th, 1897.

INTRODUCTORY NOTE.

the fifteen years 1881—95, measles caused more deaths e in England and Wales than small-pox, scarlet fever, ia, and typhoid fever combined.

:s *attacks chiefly* children in the third, fourth, and fifth life; the *greatest mortality* occurs in the second year of is pre-eminently fatal in the second, third, and first life; and this being so it follows that if measles, which erally epidemic every other year, can be so far dis- by preventive measures that it acquires epidemicity y fourth year, a large number of children will have e age at which the disease is most fatal, and many be saved.

lowing for England and Wales the Annual Rates of ality per 1000 *persons living at all ages, in groups of* *from* 1851 *to* 1895, *from the seven principal Zymotic uses.*

	1851—60.	1861—70.	1871—80.	1881—90.	1891—95.
....	0·22	0·16	0·23	0·04	0·02
r.........	0·88	0·97	0·72	0·33	0·18
....	0·91	0·88	0·48	0·23	0·18
....	1·08	1·08	0·93	0·67	0·63
ough ...	0·50	0·53	0·51	0·45	0·39
....	0·11	0·18	0·12	0·16	0·25
....	0·41	0·44	0·38	0·44	0·41

It will be seen from this table that the only Zymotic diseases that show no decline in mortality during the periods 1881—90 and 1891—95, as compared with the three decades prior to 1881, are Measles and Diphtheria.

The Means recommended by Dr. Thomson for obtaining control of Measles (Report of Medical Officer of the Local Government Board for 1894-95).

A. *Sources whence information may be obtained as regards occurrences of measles.*

(1) The adoption of compulsory notification by the medical attendant and householder.

This must be regarded as defective, and must be used as a clue to the detection of other cases. Efforts must be made to ensure systematic notification by the householders—as by the distribution, through the medium of schools or by placarding, of handbills impressing on householders their duty, and their liability if they fail, to notify.

(2) Careful enquiry in every instance to trace, where possible, the source of infection; supplemented by house-to-house visitation in the immediate neighbourhood, where necessary.

(3) Notification by school authorities, including School Attendance Officers, of any known or suspected cases of measles of which they have information, and also of the names and addresses of absentees from school.

(4) Information, general or particular, from Poor Law Medical Officers, Relieving Officers, Guardians, District Visitors and Clergy.

(5) Prompt information from Registrars of Death of all measles fatalities.

B. *Preventive measures which should be carried out in all invaded dwellings.*

(6) Every case to be promptly visited by an officer of the Health Department, to ascertain and advise upon the required isolation. Verbal instructions to be supplemented by handbills, and frequent visits made, so as to ensure observance of proper precautions, and to aid in early detection of cases.

Those who cannot be isolated at home should be removed to Hospital.

(7) Houses to be thoroughly disinfected, along with infected articles, at the termination of each case.

(8) Continued observation of members of invaded household for at least 14 days after disinfection, with a request that the occurrence of any suspicious symptoms shall be notified at once to Medical Officer of Health.

C. *The preventive measures that should be taken throughout the invaded district.*

(9) The notification to the Health Department of the occurrences of measles by School Authorities.
(10) Exclusion of members of households invaded by measles from school for a prescribed period, or pending the production of a medical certificate.
(11) Exclusion of children inhabiting houses in the immediate neighbourhood from having personal communication with infected houses.
(12) Well-timed closure of public elementary schools, and also of Sunday and private schools.
(13) Precautions with reference to library books.
(14) Prohibition of those residing in invaded households from carrying on occupation—when such a step appears necessary.
(15) Instruction of the public upon the gravity of measles.
(16) *Temporary* addition to the Sanitary Staff for the purpose of effecting the necessary enquiries, visits, disinfections, &c., &c.

Dr. Thorne Thorne believes, with Dr. Thomson, that "if any approach to complete success be aimed at, each one of the several measures indicated must be regarded as necessary and supplementary to the others."

A List of Districts in which Measles was compulsorily notifiable prior to March, 1892; and the results up to March, 1897.

Sanitary District.	Population in 1891.	Results of Notification up to March, 1897.
Abergele & Pensarn (U)	1,981	'Doubtful Value' (M.O.H.)
Barnard Castle (U) ...	4,341	Revoked.
Barry & Cadoxton (U) .	13,268	Revoked.
Budleigh Salterton (U) .	1,770	
Barton Regis (R)	12,040	Revoked.
Blackpool (U)	23,846	M.O.H. in favour of.
Bolton (U)	115,002	Revoked.
Beaconsfield (U)	1,773	
Birkenhead (U)	99,184	'Useful' (M.O.H.)
Carlisle (R)	16,009	'Neither amount of sickness or mortality affected in any way' (M.O.H.)

Sanitary District.	Population in 1891.	Results of Notification up to March, 1897.
Chesterton (U)	7,526	Revoked.
Clayton-le-Moors (U) ...	7,155	M.O.H. thinks it useful.
Colchester (U)	34,559	M.O.H. thinks it advantageous. No evidence.
Coventry (R)	284	
„ (U)	52,724	Revoked.
Cricklade and Wooton Basset (R)	11,835	M.O.H. unable to give an opinion.
Croydon (R)	29,632	'Fails in leading to appreciable prevention' (M.O.H.)
Darlington (R)	11,452	Revoked.
„ (U)	38,060	Revoked.
Dartmouth (U)	6,038	
Devizes (U)	6,426	'Doubtful Value' (M.O.H.)
Dodworth (U)	3,106	Revoked.
Dolgelly (R)	9,980	
East Grinstead (R) ...	14,713	No evidence of good. M.O.H. uncertain as to value
Edinburgh (U)	261,261	No evidence of good.
Exmouth (U)	8,097	
Faringdon (R)	13,544	Revoked.
Featherstone (U)	7,528	
Hanley (U)	51,846	M.O.H. thinks the information has been of value.
Hemsworth (R)	14,631	Revoked.
Heston & Isleworth (U).	26,271	
Hucknall-under-Huthwaite (U)	3,132	Revoked.
Ilkley (U)	5,767	Considers useful (M.O.H).
Jarrow (U)	33,682	Revoked.
Kidderminster (U) ...	24,803	Revoked.
Kington (U)	2,086	'Doubtful Value' (M.O.H.)
Lancaster (R)	14,510	'Do not think it has done much good' (M.O.H.)
Lichfield (U)	7,864	
Lincoln (R)	25,778	Revoked.
London (P)	——	
Long Eaton (U)	9,636	Revoked.
Malvern (U)	6,107	M.O.H. considers valuable.
Malvern Link (U) ...	3,765	Revoked (?)
Mansfield (U)	15,925	Revoked.
Mansfield Woodhouse (U)	2,819	Revoked.
Mexborough (U)	7,734	

Sanitary District.	Population in 1891.	Results of Notification up to March, 1897.
Much Woolton (U) ...	4,545	
Neath (U)	11,157	Revoked.
" (R)	26,000	'No great value derived' (M.O.H.)
New Malden (U)	3,437	
Newquay (Cornwall) (U)	1,891	
Penzance (U)	12,448	
Pontefract (U)	9,702	'No reliable data,' but M.O.H. thinks it 'gives some control over the spread of the disease.'
Preston (U)	107,573	
Reading (U)...	60,054	'Mortality cannot be shown to have been reduced' (M.O.H.) 'but thinks of some value.'
Richmond (Yorks) (R)..	8,419	Revoked.
Ruskington (U)	1,095	Revoked.
St. Neots (R)	11,161	M.O.H. favourable.
Saltash (U)	2,541	'Of great use' (M.O.H.)
Sherborne (U)	3,741	'Useless' (M.O.H.)
Sleaford (U)...	4,655	Revoked.
" (R)...	17,916	Revoked.
South Molton (U) ...	3,126	'Did no good in 1893, but is of opinion that it was of assistance in 1895–96' (M.O.H.)
Stamford (R)	8,812	Revoked.
Sutton-Coldfield (U) ...	8,686	'No appreciable effect' (M.O.H.)
Sutton-in-Ashfield (U)..	10,563	Revoked.
Swansea (U)	90,423	Revoked.
Thirsk (R)	12,188	'Some benefit' (M.O.H.)
Todmorden (U)	24,725	Revoked.
Towyn (U)	3,294	
Uppingham (R)	11,204	Revoked.
Worsop (U)	1,467	Revoked.
Wells (Somerset) (U) ...	4,822	'Valueless' (M.O.H.)
Weymouth (U)	13,769	Revoked.
Widnes (U)	30,011	Revoked.
Whitworth (U)	9,766	
Withington (U)	25,729	'Considered to be advantageous' (M.O.H.) No evidence.

The discussion which I have the honour of opening this evening is upon a subject which has already received from health officers the careful consideration which its importance demands, and this meeting affords us the great advantage of exchanging views upon a preventive measure—the only one, I believe—on which health officers are divided as to its value.

But divided as we are in our estimate of the value to be derived from bringing measles within the scope of the Infectious Diseases Notification Act, we are united in the common concern with which we view the tremendous and unabating ravages of the disease, and in our recognition of the fact that some effort must be made to check a mortality which is so largely preventable.

Many of us have been reluctantly compelled to the conclusion that the Infectious Diseases Notification Act is not the weapon by which this disease will be successfully assailed, and I propose to set forth the facts which appear to me to justify that conclusion.

Now the arguments that have been adduced in favour of bringing measles under the Act are the following:—

It is claimed that compulsory notification furnishes early information of the first cases, and notification is the only—or the best—means of getting this information. That this information furnishes an opportunity of visiting parents and guardians and advising as to isolation, &c., and removal to hospital (where such provision exists); of controlling school attendances; and of a prompt detection (to be followed by closure) of schools which are acting as foci for dissemination of infection.

It has been asserted that the notification of measles, and the measures resulting therefrom, would make the public regard the disease with more awe; and also that it could further a more general medical attendance on sufferers when a 2s. 6d. fee (for notification) was paid from the public purse.

It has been argued that if notification is desirable in scarlet fever then it is also desirable in measles; but those who advance this argument lose sight of the following important facts: That in scarlet fever the susceptibility to the complaint is considerably less universal than it is in measles; that in scarlet fever, children under one are comparatively rarely attacked, and the attacks at ages under five amount to less than half of the total; that the short pre-eruptive stage of scarlet fever is little if at all infectious and the rash follows in about twenty-four hours from the onset of symptoms; that scarlet fever is much more influenced, as to its incidence upon households, by insanitary conditions than measles is. If all these important considerations applied equally to scarlet fever and measles then it would be

to argue that measles could be made notifiable with the
rospect of success as scarlet fever.

' it is generally admitted, and I think there are few who
dispute the fact, that notification is useless after the
on has once gained a hold on the community; for the
infection burns so fiercely when once it gains a footing
ile the fuel lasts. Is it of value then in furnishing in-
ion of the first cases? Well, unfortunately the notifica-
arly as it may be, comes too late where measles is
ed, on account of the exceedingly infectious pre-eruptive
f this disease; four days have to elapse (during which the
n is at its highest) before the characteristic rash appears,
ther day at least will follow before the notification is
l and acted upon. Prior to the rash the disease cannot
nosed, and all those who are susceptible have been fully
to the infection. This is the intrinsic difficulty which
e faced in measures dealing with this complaint. The
n is communicated in houses and schools before it is
ed, and the rapidity of spread, and the consequent
y of checking it, are shown by the manner in which the
of notifications of the disease frequently jumps up from
ow figure in one week to a high one in the next. Let
l to you an extract from a letter I have recently received
r. Fenton, Medical Officer of Health, Coventry, in which
a typical instance, from a recent experience of his, of
lious origin of the infection, the rapidity of its spread,
the very general susceptibility there is to the infection:
er a period of comparative freedom an outbreak was
as follows: Thirteen children attended a dancing class
rnoon, including three of my own and two of a friend's
l just arrived in the district, and who had been exposed
nfection of measles before arriving. These two children
my house and spent the evening in my presence. There
thing to attract my attention to their condition, and
so well were they that they had walked six miles in the
, had danced in the afternoon, and walked home about
at night. Next day they both sickened and developed
. Of the remaining eleven children two were presumably
, having previously suffered from measles, but the whole
nine developed measles during the following fourteen
In my Report on this subject are the following
: 'It would thus appear that infection may be
ted from an individual who, though having the disease
ystem, has not yet shown the slightest indication of it;
in mind this, and also that the above-mentioned out-
ccurred amongst the more observant and intelligent

classes, it cannot be surprising if poorer and less careful parents send their children to school occasionally after the infectious stage has set in, and that the presence of such children in school or in public places should rapidly light up an epidemic quite beyond the control of the Sanitary Authority.'"

If notification is the best means of gaining early information of the first cases—I do not hold that it is the only one—then it must be admitted to be a very poor best, for it does not bring a large number of the most urgent cases to the knowledge of the sanitary authority. There is a great tendency among the poor to regard the disease as inevitable and trivial and in consequence they do not recognise the desirability of isolation, nor do they consult a medical man in a large percentage of cases, unless grave symptoms supervene. In country districts, in the opinion of some of my correspondents, the *majority* of the cases are not medically attended. Obviously, then, those cases which, cropping up in small houses generally crowded with other children, are the most potent for harm, are not notified, and we receive and pay for the notification of cases among the better classes, who have already called in a medical man and received the benefit of his advice. To meet this difficulty it may be urged that there is the remedy of enforcing notification on the parents or guardians; this will continue to prove, as it always has done, an utter failure in practice. If frequent visits were made and the penal clauses of the Public Health Act most rigorously applied, then dual notification might not continue to be the dead letter that it is. But assuming that all the measures recommended by Dr. Thomson were in force (including supervision of the premises), parents would be even more opposed to the procedure than they have hitherto shown themselves to be. The procedure would become very unpopular and compulsory notification by parents and guardians would soon be shelved along with compulsory vaccination.

The inevitable failure then of notification to bring a large number of early cases to the knowledge of the sanitary authority is the chief reason why it so generally breaks down in practice, for it does not offer sufficient opportunity of controlling the spread of infection from house to house and through school attendance.

Now the advocates of notification very properly urge that what is wanted is prompt isolation of all early cases. That is conceded by all; but it is difficult to see how notification can bring that about, unless at the same time sufficient hospital accommodation is provided—for in every epidemic it is observed that almost the whole, and sometimes actually the whole enham, 1892, 1895–6, &c.), of the mortality is among orer classes, and everyone must recognise that efficient *olation* of children under five is with them an impossi- The age incidence of measles has not yet been calcu- rom sufficient data to warrant any dogmatism upon the , but one may safely conclude from already ascertained ıat at least 75 per cent. of the cases occur in the first ırs of life.

s everyday experience is totally opposed to the prac- y of anything approaching sufficient home isolation of ı of such tender years in 90 per cent. of the dwellings poorer classes; this fact warrants the view, which to d is abundantly supported by the actual experience of hat without the means of offering hospital isolation ory notification of measles is well-nigh stripped of its ss.

notification plus *efficient* hospital isolation has never ed. Why is this? It is because any effort in this ı is recognised as impracticable and hopeless, for two t reasons: mothers will not be found to part with at the tender years in which they are mostly attacked les, and it would be useless to resort to compulsory s; I cannot believe, therefore, that in practice we ucceed in procuring such isolation in 10 per cent. of s urgently requiring it. But assuming that this diffi- l not exist, or was surmountable, it would be found mpossible to make the necessary hospital provision. ould the requirements be of such a hospital? Well, a limited amount of provision might in some cases do isolating early sporadic cases, and thus check an in inter-epidemic periods—it will generally prove

otification returns that I have seen, of urban districts, ıerally demonstrate how a population which is very n measles sickness in one week, or one month, fur- very large number of cases in the next; in default, earlier information than notification secures to us, and n mind that notification can never bring to our know- large percentage of cases, how is one to prevent con- outbreaks at times, and how is one to limit them the means of isolating a *considerable number* of ?

inburgh, during 1884-93, there were instances where er of cases notified in one month rose to the extent n the next, and where one-half and one-third of the ifications received in one year came to hand in one month; and in Birkenhead, 1882-92, there was an increase of over 200 between two months, and one-half to one-third of the total notifications were received in one month: these facts demonstrate that the high infectiveness and rapid diffusion of measles were not much affected by the notification of the disease, although there was some hospital isolation provision in both cities.

If hospital isolation provision is to be of value it must be sufficient, and not a mere make-belief; and if one is to reap the *full measure of benefit*, both so far as a reduction in incidence and case mortality are concerned, I think our experiences with scarlet fever will show that provision should be made for removing every case which requires isolation. Let us see what this would mean in Metropolitan London.

In London the mean annual number of deaths from measles for 1890-5 was 2,680; allowing a case mortality of five per cent. there would be 53,600 during the year; if all of these were notified the number of certificates from measles alone would exceed, by some 12,000, those of all the other notifiable diseases added together. Assuming that 30 per cent. of the cases notified would require isolation, then over 16,000 cases would require removal in the year—or an average of over 300 a week. But the cases would not be evenly distributed over the year: in London a study of the mortality figures shows that for many weeks the number of cases of measles may be only from 1–200, and in other weeks may rise to over 3,000. Now, each case would have to be retained in hospital for at least three weeks, and since during three weeks 8,000 cases might be notified, at least 2,400 beds should be provided if those who believe in the practicability of procuring efficient isolation in the case of measles are prepared to argue that all those requiring isolation should get it.

But in addition to the magnitude of the accommodation required, think of the enormous difficulties and expense of administration of a hospital, say of 250 beds, with a baby under five in 75 per cent. of them, and a baby of two in a considerable number! A large hospital, with an exceptionally large staff, would have to be prepared, almost at any moment, to receive measles patients in every community of 20,000; and this hospital, and at least a large part of the staff, would figure as a heavy permanent expense to the community, although for many months at a time it might not be required. Now, waiving the question as to whether hospital isolation would effect much in the matter of reducing the attack rate from measles—and it is a matter on which one is entitled to considerable doubt—would the removal to hospital, by reason of ter treatment and supervision, reduce the *case mortality?* o, this alone would be a great argument in favour of such on. Well, the case mortality in most of the hospital figures have examined is considerably above that of those at home, and at least the bulk of the difference is ss due to the exceptional severity of the cases taken to ; but I have thought whether a little of the difference not be due to lung complications arising from the e—slight, but inevitable—which is entailed by the of the patient, in such a malady as measles. If there ng in this latter point, then some hospital provision at least be valuable as a means of reducing the case y.

nsideration then, of the matter of the provision of t hospital isolation is not encouraging, and the actual ent has never yet been attempted; but the facts that in gh (1886—91) only six per cent. of the cases notified moved to hospital, in Blackpool (1891-5) only eighteen .; and in Birkenhead (1882—91) the figure was less than cent., are to my mind highly suggestive of the es that have to be faced.

w of these circumstances, surely Dr. Thomson's advice eport is a "counsel of perfection"—as desirable as it is cable. "The patient," he says, "should be kept apart her members of the family in a suitable room, and in f an attendant who should have no personal communi- ith other inmates of the house, or should be removed able hospital."

he poor who furnish the large majority of deaths, and responsible for the bulk of the spread. How they, in lemented houses or small cottages, and with their large are to do as Dr. Thomson so properly recommended e even a greater enigma to them than it is to us; and e such difficulties in the way of securing removal to of those requiring it, and in making the necessary pro- r their accommodation, that the advantage to be gained ng the attempt is open to some doubt.

of isolation provision, the greatest check to spread e the exclusion from school of children from infected the sending home of suspicious scholars, the visitation itees, the notification of infected households to school ice officers, and the occasional closure of schools during periods—in short by availing ourselves of all the measures" which may be taken to check spread.

pinion is very much divided on the benefits actually from school closure, and it is certain that epidemics cannot always be prevented or controlled by school measures alone, for many of the children do not attend school at the period when the attack rate and case mortality are both exceedingly high, *i.e.*, from two to three; and there are periods of the year when the schools are closed and all the children are at home. While, however, school closure—especially of the infants' departments—has probably been useful in some cases in rural areas, there is a greater difficulty in proving its value in urban districts. In some cases it seems to have done good (as notably in Coventry, 1886, 1889, 1894), and in others to have had no effect (as at Blackpool, 1893, Sutton-Coldfield, 1893); and it must be borne in mind that some apparently satisfactory results from school closure are doubtless to be attributed to exhaustion of susceptible material or seasonal decadence. In Coventry, where it is claimed to have done great good in 1894, it should be noted that *all* the schools in the city were closed for six weeks; and it seems to me that when once the epidemic has gained a footing, nothing short of this drastic measure will prove of value, and the closing of one or more schools in these cases cannot be shown to have effected more than a *temporary* check to the spread of the disease.

But if school closure is to prove of value in preventing a general outbreak, it must be carried out as soon as an epidemic threatens, and this might mean that in populous shifting communities some schools would have to be closed twice or even thrice in one term. The matter is, moreover, further complicated by the fact that the Sunday and private schools cannot be *compelled* to close, except under the provision of some local Act, and often when one school is closed, children are sent to another.

When, then, outbreaks occur in small areas of population, school closure early in the outbreak would doubtless do good, for the children—even though they play together in the streets, &c., run less risk of infection than in crowded ill-ventilated schoolrooms; but such a step must be done early, and the reason why the measure so often fails is, I believe, because the information derivable from notification returns, and which would suffice to warrant closure, almost always come too late.

I next turn to the consideration of the cost of notification and of hospital isolation, not because I hold that this should unduly weigh with an authority entrusted with the duty of protecting the public health, if it can be shown that an advantage is to be reaped; for great as the cost would be, so is the evil against which it is expended, and so would be the value of the result achieved. But I cannot find fault with an authority for requiring some convincing evidence of probable before facing any great expenditure of the public funds, contend that a Medical Officer of Health has but little han an optimistic opinion to offer in favour of notification, off to many stern uncompromising facts which can be l against it.

hall all agree with Dr. Thomson's Report, that if notifis to prove of service every possible use must be made of ormation it provides. Every infected household must nptly visited; the source of infection tracked; the e of unnotified cases discovered, if possible, from the orded by the notified cases; schools, libraries, &c., must fied; premises must be disinfected; suitable isolation l (where possible). Now all this entails a large staff, do not agree (with the Report) in believing need only ged on emergency. It takes a week or a fortnight to he services of suitable officials, and a disease with such spread must be nipped in the bud *immediately* and out at its commencement. There have been instances easles notification has been adopted at a period of panic epidemic and where Sanitary Authorities have delayed pointing the requisite staff, and the result has been the le one—*i.e.* a large expenditure in fees and absolutely else. There are, then, urgent grounds for an increased *nt* staff where measles is notified, and yet the disease practically absent for two years in some communities, some months in even populous districts!

eason then why Dr. Thomson was unable to point to district as having systematically adopted all the measures of precaution for the prevention of measles, considered advisable, are very obvious. It is a matter executive and clerical, and the great expense which his vould have entailed.

otification fees alone would amount annually to an of at least £300 in a community of 100,000, if we take al attack-rate from measles at 28 per 1000 and allow gh proportion of shilling fees. The 2,800 cases would te quite 9000 visits, and in Dr. Thomson's scheme at 000 (involving an average of about 70 visits a day, but hundreds during an epidemic period). At least four officers would be required to do this work alone.

st of isolation hospitals would amount to quite £1 5s. for each patient (exclusive of repayment of loans), so patient admitted would cost about £4; and the cost ection, clerical staff, printing, &c., would also be very

n, notification proves a failure, it is also a costly one, and if full advantage is to be taken of the information procured by notification, an expenditure amounting to *at least* 6d. in the pound would be involved.

While, then, notification of measles is unsound in theory, it is most discouraging in effect. During the past six years a few (under one per cent.) of the Sanitary Authorities in England and Wales have included measles in the list of notifiable diseases, and what has been the result of the experiment? In the majority of cases the Medical Officers of Health either candidly acknowledge that they have reaped no advantage, and that the measure is a useless one, or they express their doubts as to its utility; and in two instances only has there been sufficient evidence adduced to make one believe that the measure itself may have brought about a reduction in the measles mortality. In some cases, it is true, there was a falling off in the mortality during the year or two following the adoption of its compulsory notification, but it must be borne in mind that in these cases the notification was adopted either during or following a period of epidemic prevalence, and that in the nature of things there would be a falling off in the number of cases during the subsequent year, or perhaps two—for some time must elapse before another batch of susceptible children gets into the community.

The consequence is that in many instances where measles has been made notifiable the practice has been discontinued, because in operation the measure has been found to furnish no apparent good in return for much expense and trouble.

From Dr. Thomson's Report (p. 158) it appears that he visited twenty-four districts wherein compulsory and voluntary notification had been tried thirty-three times. In twelve instances compulsory notification had been discontinued, in ten cases voluntary notification had been tried and discontinued, and in only eleven cases was compulsory notification in existence at the time of his visit. He was, moreover, unable to show satisfactory results in a single instance; and he points out that unjust conclusions as to the value of the measure must not be drawn from any results hitherto apparent in these districts, for in no case had *every precaution which he recommends* been adopted. Well, it has been shown that the trouble and expense of the very thorough scheme recommended would be enormous in urban districts, where the chief mortality occurs, and it is a question whether any authority could be found that would be prepared to face it.

Turning to the Twenty-sixth Annual Report of the Local Government Board (1895–6), it appears that ninety Sanitary Authorities had, from time to time, included measles, and

-eight (or nearly one-third) had revoked it; and of
n 11,000 and 12,000 districts in which the Infectious
es Notification Act, or a Local Act, is in force, only
wo—or about five per 1,000—included measles among
tifiable diseases.

n indebted to many Medical Officers of Health for
ice in an attempt to bring the experiences of notifi-
of measles up to date. I have purposely not dealt
e districts in which notification has been made com-
for only a year or two, because when a disease has an
ic periodicity which may even extend to four years, no
e opinion can be formed of the use of the measure from
of such short duration, and on this account the Local
ment Board now generally insists that the experiment
made for four or five years at least.

ist on p. 163, therefore, comprises those districts in which
was compulsorily notifiable before March, 1892, and
lts are given up to March 1897. You will observe that
ricts alluded to, numbered 77 up to March, 1892, and
March, 1897, in 32, or 41·5 per cent., the notification
n revoked, leaving 45 in which the experiment has been
ed for at least five years and which still retain
ion. Of these 45 you will note the following facts :—
irteen of the districts the Medical Officers of Health are
o say that the measure had been of value.
elve districts some value is claimed—or conjectured—
statistical evidence of a satisfactory nature, can be
of its value.
ly two instances where notification still remains in
ter a trial of five years, can any satisfactory statistical
of its value be claimed.
inion or information has been obtained in reference to
n the remaining eighteen districts.
oydon (R) and Blackpool the returns indicate a *slight*
ion in mortality—which may be due to notification—
ither of these districts can any reduction be shown in the
te.

onclusion, therefore, to which I am driven is that it may
l to bring measles under the Notification Act in rural
and in small isolated communities, if in these cases every
ge is taken of the information thus obtained, if efforts
made to detect unnotified cases, and the means of hos-
lation be provided ; but in larger communities, especially
t adopted in neighbouring districts, the measure is not
ommended in the absence of sufficient isolation provision,
permanent staff, and the adoption of other means than

"notification" of bringing the existence of cases to the knowledge of the sanitary authority. In short, if it were possible, in urban districts, to deal with every case notified with the same care and thoroughness as in a case of small-pox, it might prove of value, but certainly not without.

The figures of the Paris hospitals admitting children with measles (l'Hôpital Trousseau, Enfants Malades, Enfants Assistés), establish the fact that uncomplicated measles has a very low mortality, probably not amounting to more than two per cent. of the total deaths; this fact is further borne out by noting the effect which the greater care exercised by the better-class inhabitants in guarding against exposure has upon the mortality from measles among that class, as shown by the circumstance that the mortality during epidemics is always very largely borne, and sometimes wholly, by the poor. Dr. Corfield significantly remarks, in this connection, in a recent report to his authority, that "the prevention of catching cold while recovering would do more to check mortality than anything else."

What we have, then, to face is a largely preventable mortality due to ignorance, a mortality which is very high among the poor, and very low among the better classes. It is, therefore, especially to the lower classes that any effort to remedy matters must be directed; and such is the ignorance of these classes on matters of vital concern, and the natural disinclination to any form of municipal control and supervision is so strong in them, that it is difficult for me to believe that any of the powers or resources at present possessed by sanitary authorities will suffice to secure that large measure of control that is necessary to check the spread of a disease like measles. Surely the best remedy lies not in notification, but in the education of the masses, and in the taking of certain precautions against school infection.

All organised efforts which have hitherto been made to give such education to adults have met with scant response. There are only two means at our disposal: one may distribute handbills or booklets, which are seldom read; or may offer free lectures, which are seldom attended except by those who least require them. We must begin at the beginning and educate while in childhood; even if adults were approachable for the purposes of education, they have already adopted fixed ideas and habits which it would be difficult, and often impossible, for them to cast off. The State must deal with the individual while he is still under the control of its compulsory education, and then the simple and priceless knowledge of the laws of health and disease prevention may be taught and instilled into who are receiving their general education, whose minds istic, and whose characters are forming.

slow and sure remedy is to make our educational system nal one, in which, in the selection of the matter that is , sufficient consideration is given to that which is of vital ance. There are subjects taught at schools which not ight, but *ought* to give place, on the score of expediency, iess, and even of humanity, to such matters as the Laws lth, the precautions that may be taken against disease— ous and otherwise; and special instruction should be given on the healthy rearing of children. A brochure dealing he subject in a proper and sufficiently elementary has not yet been written. Among the many ele- y works upon hygiene, there is not one which can be be entirely suitable for purposes of elementary on on the lines indicated; each contains material which f intrinsic value, and in each there are some matters nsic value which are either not suitably dealt with or irely omitted. If the elementary material to be taught ll defined, then it would not be difficult to secure the of teachers who are competent for the work; and it be the duty of such teachers to offer as many object as possible, by applying to the children and their sur- gs the vital principles that they teach.

active co-operation of school authorities with the local ies should always prove of value, but many experiences at teachers either frequently fail to notify cases of sus- llness, or only do so after many cases have occurred. If are to reap the greatest benefit in the direction of the spread of measles through schools, it appears to we must *act up to* the knowledge we now possess, *i.e.*, eral infectious diseases largely spread through schools. olars in each school would then be examined by a man, at frequent intervals during even inter-epidemic and almost daily during epidemic prevalence; all would be sent home and requested to see a doctor, absentees visited and the true cause of their absence ied. A scheme which thus fully takes advantage of means which schools offer of (*a*) educating the future and of (*b*) gaining early information and checking the f infection, appeals to me as likely to offer a surer f reducing measles mortality, and at considerably less and cost, than any scheme involving "notification."

Professor W. H. Corfield (London), holding the same opinions on Notification of Measles as Dr. Kenwood, would rather have heard the remarks of some one on the other side. Personally, he considered the paper an exceedingly valuable one; its great value consisting in, 1st, the tabular statement which accompanied it, so necessary in a subject of the character under discussion, where ascertained facts were of the utmost importance; and 2nd, the advice tendered by the author as to the necessity of education, and the methods by which it might best be carried out. For a very considerable time he had taken deep interest in the matter. In 1892 his Authority asked his advice as to the desirability of including measles in the list of notifiable diseases, and the reply he gave them was not to do so, chiefly on account of the infectious character of measles before it is recognisable, and also the difficulty in securing isolation; and he had quite recently repeated this advice to his Authority in another report. In large towns and populous districts the isolation of cases of measles is practically impossible; there is not sufficient hospital accommodation for one thing; again, it must be remembered that measles is especially fatal in the second year of life, and mothers naturally decline to allow their infants to be taken away at such a tender age. In the better class population there exist certain facilities for taking precautions, and isolation and the necessary watchful nursing can be done with comparative ease; but with the poorer population this is impossible, and on the after care of the patient so much depends To the ignorance of the people, especially the poorer, is largely attributable the deaths which result, not so much from the measles itself, but rather from the lung complications which follow, and anything that could be done in educating the people ought to be eagerly taken up. It was not difficult to get early information from the schools, and where the disease appears to be assuming epidemic form the Medical Officer of Health can secure the closing of the Infants' Departments of the Schools, and thus more easily confine the area of the disease. He had great faith in this procedure, and had often seen good results from it.

Dr. A. Newsholme (Brighton) while admiring the paper, held modified views on the subject, as compared with Dr. Kenwood. He had noticed all through the paper that the arguments used against the notification of measles might almost equally well be used in opposition to the notification of every other infectious disease. He did not agree that notification would be of no use when the disease had got a thorough hold of the community. They could visit the parents, educate them, and secure for the patient home isolation and proper treatment, and so reduce the fatality. He felt there was confusion in the paper between isolation of the patient, and isolation of the household, for while they might be unable to isolate the *patient* they could isolate the *home*. He had found it quite possible to effect the former in Brighton, and this fundamental principle ought to be borne in mind. Again it is said measles notification is not complete; nor is it in scarlet fever; yet he had not heard anyone suggesting the ility of abandoning its notification on such account. Then Dr. Kenwood urges that if the methods enumerated by Dr. on were to be put into force parents would be against them. every disease where notification is insisted on and removal d. The opposition was natural; but in the face of achieved would diminish. With the statement that complete hospital n was necessary he disagreed, and he admitted the impossibility ing this, but they could make each home an isolation hospital ited sense, and so prevent the spread of disease through the ngling of the children in the streets, and public schools. The itherto taken in districts where measles was notifiable had rtially unsuccessful, because the notification of this disease is pulsory throughout the country, or even in adjoining districts. otification became general, the machinery would be found to more useful. It was not necessary to notify every case; if case in a family or house were notified, the oversight of the Officer of Health would secure the notification of ensuing The statement of Dr. Kenwood that notification of measles, entirety, was useless, was open to objection, for they must owledge on the subject, and to obtain this they must have lative to the visitations of measles and their relation to and climatic conditions. What he hoped was that an or would be made to secure a modification of the present f notification rather than the entire surrender of notification. less expensive method than the one contemplated under the Infectious Disease (Notification) Act might be devised and h would be equally efficient as a means of preventing the f disease.

. E. ARMSTRONG (Newcastle-upon-Tyne) felt they were to Dr. Newsholme for the manner in which he had put the e of the argument to that of the author of the paper, and hed his statement by the fact that he spoke after practical e. Personally, he had advocated the notification of measles ck as 1883, and ever since. He had succeeded in getting cil to take his view of the matter in September last, when— it had been rejected by a vote or so over and over again— een lately adopted with only four dissentients. What alter- heme for notification does Dr. Kenwood offer? Because is the "big boy" of the family of zymotic diseases, is he to attention? School-teachers had impressed on them the of notification. Dr. Corfield had said they could deal with through schools without notification in the usual way, but rmstrong) thought school-teachers had many absentees, of of whose absence they knew nothing. In Newcastle the notified to the Sanitary Authority every absentee not to the school by the Medical Officer of Health. He had vocated the removal of every patient to hospital. What done is to deal with epidemics in such a way as to obviate ssity of hospitals. With regard to the four-day period during which measles was infectious previous to development of the characteristic rash, used as an argument, it might on the other hand be argued that this was no reason why the chance of infection should be neglected for the next four weeks. They must not admit measles to be an "old woman's disease," as it too often was considered by ignorant people. True, as Dr. Corfield had said, the mortality was largely due to chest complications ensuing, but there were many phases of the disease without chest complications *per se* which led to large fatality. With regard to the extent of the disease in Newcastle, there had been in a population of some 200,000:—

A.D.			
1883	.. ..	209	deaths.
1885	.. ..	359	„
1887	.. .	211	„
1893	.. ..	208	„
1895	.. ..	140	„

School closing was, he believed, very beneficial, and in Newcastle the Sanitary Authority had closed all the schools for a month, but it would be better to adopt the period of six weeks as at Coventry. Owing to the closing of the schools the cases during the period referred to had fallen from nearly 40 per day to 8 or 10 per day. He felt that much good could be accomplished by closing the schools in reducing epidemics.

Dr. L. W. Darra Mair (Croydon Rural District) said he was much interested in the question of measles notification, and as he happened to be the Medical Officer of Health to a district in which compulsory notification is carried out, he thought it would be most useful to give them a broad outline of the statistical evidence of his district. Measles was made notifiable in the middle of 1890, but as the returns for that year were incomplete he had dealt only with the records of the six years 1891-96. The district is technically rural, although largely urban, and can be conveniently separated into three divisions, one almost entirely urban, of about 11,000 people; one less urban in character, of about the same population; and one entirely rural with about 5,000 persons; and is bounded by London parishes, the town of Croydon, and several large urban and rural districts, in none of which is measles a notifiable disease. The mortality from measles during the six years of the notification period, as compared with the ten years (1881-90) immediately preceding, showed that in the whole district it had fallen from 346 per million, to 293 per million, which although not very great was a distinct fall. In scarlet fever the corresponding fall had been much greater, nearly 50 per cent, while in the case of whooping cough, which is not notifiable, the fall in mortality rates was certainly not less than in measles; therefore he felt the utility of notification of measles in reducing mortality had not yet been so striking as might have been expected. Of the four diseases—scarlet fever, diphtheria, measles,

hooping cough, the mortality from measles had been the
in the urban division, both in notification and pre-notification
, that from whooping cough next, then diphtheria, and
fever lowest of all. In the semi-urban division whooping
ras highest, diphtheria second, measles third, and scarlet fever
owest. The notification returns show that in the urban
the average annual case rate during 1891-96 had been 16·4
00 living, while in the semi-urban it had been nearly 15 per
nd in the rural a little over 9 per 1,000, while in the same
the fatality or case mortality had been 3·6 per cent. in the
nd ·9 per cent in the semi-urban divisions. Comparing these
with the returns of scarlet fever he found the case rate of that
had been 4·4 per 1,000 in the urban division and 3 per 1,000
semi-urban, with fatalities of 3·4 per cent. and 1 per cent.
vely, and after making all allowances he felt justified in
hat during the six years of notification the fatality of measles
n nearly the same as scarlet fever, while he was unaware of
g peculiar in his district which could in any way affect the
deduction to be drawn from this result, which appeared to
e important in view of the greater readiness of the public to
carlet fever with care, and measles on the other hand as *only*

The cost of notification of measles during the years 1891-96
n almost exactly double that of all the other diseases put
, the exact figures being:—for the whole district measles
ion for the six years had cost £280, and the other diseases
r taking the urban division only, measles notification cost
½d. per head per annum, and the other diseases £62 or about
ead per annum. Taking the former basis general notification
s for the whole country would cost about £50,000 per annum.
onal experience of measles notification had extended over
d-a-half years, during which time there had been two epidemic

During the first, the notifications were accepted and practi-
hing further done to ascertain unreported or unattended cases,
hose heard of during enquiries made into notified cases, but
he second, two circular letters were widely distributed, one
lvice as to the management of the disease, the other insisting
holder's notification, but in addition to this the whole of his
concentrated on the work of visiting infected houses,
bsentees from school, and making house-to-house enquiries in
streets and localities. The results were that 102 unattended
re reported by householders only and 131 discovered by the
eans out of a total of 1,042 cases; but although three
were engaged on the work the notifications came in in such
that before enquiries could be made the schools themselves
give evidence that closure was called for, especially in the
n division. Indeed in the first epidemic and also partly in
d, the first intimation he had was a sudden diminution of
tendance. In both epidemics he found, when too late, that
of schools commenced through scholars living in districts

outside, in which notification of measles is not carried out, and concerning whom neither the schools nor himself had received any information when it was wanted. His experience then, was that mortality had not been much reduced since notification of measles had been in force, and that the diminution which has taken place has been equalled by the diminution in whooping cough which is not notifiable; that the fatality of measles has been about the same as scarlet fever; and that during epidemics notification has not been of much immediate utility, owing to the lateness of the information, and the difficulty of keeping pace with the information when obtained. He would not, however, express the opinion that measles notification is to be regarded as unnecessary or useless, as he did not consider his experience a fair test. If notification of measles could become as common as that of other diseases, and could have a prolonged trial of say ten or fifteen years he thought the results would be very different, and he was of opinion that it was only by general notification of measles that they could hope to obtain that full knowledge of its general and local behaviour which was essential in order to enable them to reduce the enormous loss of life for which the disease is annually responsible, but that its utility in solitary districts like his was open to much doubt.

Professor Bostock Hill (Birmingham) agreed thoroughly with the conclusions arrived at by Dr. Kenwood, and this with the advantage of being Medical Officer of Health to a borough where notification of measles had been in operation for eight years. Looking at the average death-rate for the seven years prior to, and the seven years since, notification he found the rate was slightly higher since. For the first two or three years after the introduction of measles into the list he was able to keep the disease from being epidemic. He had every house where a sporadic case occurred visited and disinfection carried out; by this procedure they had in four years gathered a vast amount of susceptible material, and in 1894-5 they had an epidemic. Consequently they were literally inundated with certificates of notification, and were utterly unable to even visit the cases, and at the height of the epidemic could do nothing; this would, he felt, be the usual experience; they could stop sporadic cases, but with an epidemic could do nothing. School closure is of the utmost importance, not only in public elementary schools, but private schools and Sunday schools also. The difficulty of isolation was very properly referred to by Dr. Newsholme, who said he would make every home an isolation hospital; they would like to know how this was to be accomplished. So far as disinfection after measles he considered it to be unnecessary. Dr. Kenwood had tabulated a statement which showed that in a very large number of cases notification had been valueless, and in this deduction he fully concurred, for it must be borne in mind, that, while the advocates of notification based their opinions on theoretical considerations, Dr. Kenwood's figures were the expression of results in actual practice.

F. **Vacher** (Birkenhead) gave praise to the reader of the for the reserved way in which he had treated the subject; it well have been dealt with in a much more heroic fashion. He full agreement with the conclusions drawn by Dr. Kenwood, there was one point more than another on which he was in , it was in the closing of the schools, which he believed to be utmost value. In Cheshire a large number of schools were every year to check outbreaks of measles, with good results. s was not spread by milk or water, as was the case with na and typhoid fever, and owing to measles infection being before the disease could be effectually diagnosed, and the age of the patients, there was naturally very great difficulty matter of hospital isolation and removal. What was needed t so much isolation, but the proper and intelligent care of n attacked, and a knowledge of the importance of keeping the warm and protected from the risk of catching cold. Notifi- of measles was first due to accidental circumstances. The otification Act was obtained by Huddersfield, making it ry to notify the Medical Officer of every case of infectious not properly accommodated. Bolton took the matter up, ir Bill was based on the Huddersfield Act; but they asked for tained compulsory notification of all cases of "small-pox, , or any contagious or infectious fever." The result was that got notification of so many diseases coming under this general at the Medical Officer, Dr. Sergeant, deemed it necessary to note at the head of his forms, defining the notifiable diseases as ox, cholera, measles, typhoid fever, puerperal fever, continued liphtheria and scarlet fever. Measles was included in the ause most of the cases notified had been measles. Still, tions of this disease came in so rapidly, and little or no use e made of the information, that the Corporation felt some step must be taken to stop the inflow of notifications they ot use. Accordingly, in 1879 a provisional order knocking asles was applied for, and this was granted by the Local ment Board. In 1881 Birkenhead obtained powers similar given to Bolton, requiring the notification of "small-pox, fever, , or other dangerous infectious disease," and it was suggested ote should be sent to practitioners advising them that the term rous infectious disease" included scarlatina and diphtheria At the meeting of the local Health Committee at which this was to be decided, a member asked, "And why not measles?" cher did his best to show the difficulty of making use of tions of measles, but the Committee had their own way, and was accordingly inserted. Taking his reports he found that en years 1882-91 there had been 15,007 cases notified, out h 9,054 were measles, and 94 German measles; thus showing wards of 60 per cent. of all the cases notified were measles, in of which little or nothing could be done.

P. **Boobbyer** (Nottingham) felt that many of them could hardly agree altogether with either party in the debate. A certain amount of notification was necessary, but we were not yet prepared to deal with measles as we dealt with small-pox. Among Dr. Thomson's recommendations one stood out prominently—"Keep infected children within their own homes"—and this recommendation he could strongly endorse. In Nottingham they depended largely upon school officials for the notification of measles, and during the severe local epidemic of 1896 they had learnt much about the incidence of the disease from this source, and thus been enabled to secure to a considerable extent the detention (at home) of infected households—together with the adoption of other measures of prevention. Dr. Thorne Thorne, in his introduction to Dr. Thomson's report, had expressed the hope that by postponing attacks until after the second year—that of maximum case mortality—the aggregate fatality from measles might be reduced, but the speaker's recent experience during the 1896 epidemic in Nottingham (which had occurred after almost exactly twice the usual interval) went to show that such an extension would simply result in increasing the dimensions of the outbreak. The number of deaths during the year had been almost exactly doubled as a result of doubling the length of the interval between the local outbreaks. They were told that much could be done in the way of securing a general recognition of measles as a dangerous infectious disease, by educating the public; but in all probability the public would decline to regard measles as a serious disease until they had a higher case mortality than at present. The light regard in which measles was held by many led them to dispense with medical attendance, and, without this, efficient notification upon the usual lines could not be secured; nor, in cases of wilful exposure of infected persons (Sec. 126, Public Health Act, 1875), could a conviction be obtained without proof of medical attendance and diagnosis. He quoted a case in illustration, in which forty-two children were infected through attending a ball at which a child suffering from measles was present, but in which he was advised that it was useless to prosecute the guilty parties, for lack of proof of knowledge on their part of the nature of the disease—no medical man having been called in. With regard to isolation at home among the poor, he said that it was out of the question. The children could be kept away from school and domiciled at home, but isolation proper was in the majority of cases impossible. Dr. Thomson had laid stress upon the desirability of thorough disinfection after each case. This also, he regretted to say, had proved in his recent experience to be impracticable. With respect, moreover, to the provision of adequate hospital accommodation to meet the requirements of large working-class population in epidemic times, he was afraid he must express a similar opinion. The cost of provision for the isolation of scarlet fever—without mentioning other complaints—was already held by many to be a heavy burden, and when people heard that to make similar provision for measles would cost three or four times as much, they would absolutely refuse to have anything to do with it.

Johnstone (Ilkley) said the reader of the paper had said ing against measles notification excepting that it had done harm. He had had seven years' experience of notification and had whooping cough notifiable for the same time, and cause for regret that they had been scheduled. He had never fortunate as to have a single year free from measles. In had a small epidemic which was checked by notification, and elp of the elementary school teachers. It was of the utmost nce to have early intimation of an outbreak of measles, and mes sooner from medical men than teachers. So far as s went he had

In 1891	26 cases.	In 1894	5 cases.
„ 1892	9 „	„ 1895	3 „
„ 1893	6 „	„ 1896	195 „

ter outbreak was not due to any failure of notification but to that a child was brought into the town already suffering from ase. A diagnosis was made by a medical man twenty-four fter the introduction of the child, and the case carefully , as were the other children in the house, but owing to s young relations visiting the house it was impossible to the disease in this instance, yet these 195 cases represented when compared with the susceptible material in the district. horities adopted a method of isolation, closed the day and schools for no less than six weeks, and would have succeeded tter in keeping the cases down, but one of the Clergy of the held a Sunday afternoon service for the children in the church aterially counteracted the good done by the closing of the

Although the 1896 epidemic was not prevented earlier, it due to failure of notification for against this instance they his precaution been enabled to arrest four other epidemics by lation in the fever hospital. It is unnecessary to have each al case of measles notified, the first case in each house would ient, for the Act was not made for the purpose of supplying ractitioners with half-crowns, but to enable the authorities to quate precautions against the outbreak becoming general. So ucating the parents was concerned he did not think much e gained in this direction, for without the notification of being necessary they would run great risks by scarlet fever ten mistaken for measles, and treated lightly by parents, and outbreaks generated. The death percentage from measles properly been referred to, but we should look further to the ial inconvenience arising from it; a man could not go to his ing to the sickness in the house, his income ceased, and much ience, both personal and in business, was caused. He had d a year free from scarlet fever, but during the past twelve had never had anything like an epidemic, yet the notifica- this disease was of little value as a preventive till they got lation hospitals. And so it was hardly fair to assume that measles would go on at its present rate if they had hospitals for its retention and isolation, his own opinion being that the increase in expenditure would not be anything like that anticipated. Nothing like the full advantage of the Notification Act would ever be experienced until some method of isolating the diseases notified were available.

Dr. G. **Brown** (Colchester) said they had had notification of measles and whooping cough in Colchester since 1890, and he had never regretted their being scheduled. Where at first people regarded an attack of measles most trivial, they now attached importance to it. Not only was the home thoroughly inspected, but disinfection resorted to, and this not only prevented the spread of the disorder, but taught the people the value of cleanliness. The greatest educational factor in preventing the spread of these infectious diseases is their compulsory notification. Last year four new cases were imported into Colchester, and, being notified, means were taken to prevent the extension of the disease to others, with successful results. The disease extends where the population is most crowded, but the mortality is greatest everywhere in those cases where cleanliness prevails least, and where the homes are overcrowded with children. In the Camp, where more stringent measures can be taken for preventing its extension than amongst the civil population, the disease has been kept more under control, and its extension *pro tanto* limited.

Dr. J. **Fletcher Little** (Harrow) stated that in his district of Harrow they had an isolation hospital, yet in spite of immediate removal of cases and every precaution they were continually reinfected with scarlet fever from London. So with measles, from which last year they had five deaths. At times measles raged in the town, yet he had no means of obtaining statistics relative to the disease hitherto. He had recommended that measles be scheduled among the notifiable diseases, with the understanding that only the first case from each house should be notified. He regarded it as pessimistic to regard it as something with which they were unable to cope, and at the end of the 19th century somewhat humiliating, and he was glad that gentlemen were taking up various methods by way of experimenting as to the best way of dealing with it. Were notification of measles made compulsory, then in all probability concealment would follow, owing to the breadwinner being kept at home, and in cases where this was enforced he contended the family should be compensated out of public funds. Outbreaks of measles were of an uneven character, and were so different to other diseases, that it ought to be dealt with by the nation at large, and not by separate districts; and to do this he suggested the establishment of itinerant sanitary officials from the Local Government Board, who could be immediately sent to supplement the regular local staff whenever an outbreak of an epidemic character was notified. He made the suggestion with all humility, yet he believed if it were pon they would be able to check measles as they were able to own other infectious diseases.

CHAIRMAN (Dr. E. B. Forman, London) expressed the nterest he had felt in the proceedings of the meeting: ly was he struck with the remarks of Dr. Armstrong. They ard much with regard to the necessity of isolation as an to notification. Dr. Orme Dudfield had written to him notification would be of no value without isolation. There out an equal number for and against notification among the s. He noticed that in Dr. Shirley Murphy's annual report London County Council that a majority of the Vestries ended notification if it could be combined with hospital . But they had to consider what would be necessary under cumstances. It would be remembered that in London the litan Asylums Board had to provide for the paupers, and, ally, did so for others also, and if they were to compel the to hospital of cases of measles, it would be a matter for if the treatment were always to be gratuitous. In answer stion someone put, he (the speaker) would be in favour of fication of the first case only in a house. On the matter of n in these subjects, he (Dr. Forman) happened to know Dr. d had been successful in bringing home to the minds of hat measles was not always of the trivial character it was n regarded, by distributing handbills in his district. It was essary to teach hygiene in a highly scientific manner to do he Technical Education Board of London was sending out , mostly ladies, to teach the laws of health, and inculcate mmon-sense principles in these matters. They had had a le and exhaustive paper; Dr. Kenwood had thrown much t on his subject. Whether they agreed with his conclusions he was sure they would all agree with him in moving to wood a most hearty vote of thanks. He (Dr. Forman) had pleasure in doing so, for Dr. Kenwood was Medical Officer h for Stoke Newington, which was a part of the district e (the speaker) represented in the London County Council.

ENRY KENWOOD (London), having briefly acknowledged the tion of the audience, said that he must differ from Dr. Newsn his statement that the same arguments used against the ion of measles would apply almost equally to all other s diseases. There were several very special reasons why the be gathered from the notification of measles are less than se of any other notifiable disease, and these he had indicated aper. Dr. Armstrong had stated that while Dr. Newsholme self were arguing from some personal experience, Prof. Cord he (Dr. Kenwood) were arguing largely from a theoretical nt. Whereas they all valued very highly any opinion exby Dr. Newsholme and Dr. Armstrong, he was not aware that Dr. Newsholme had had any practical experience of notification, and he contended that the length of time during which the notification had been compulsory in Newcastle was too short to admit of Dr. Armstrong proving the value of the measure. He would study with great interest Dr. Armstrong's figures at the end of five years, for he felt assured that if good results were to be obtained from the notification of measles in large urban districts, the energy and ability of Dr. Armstrong would secure them. He would like to point out that he had not committed himself to the wholesale condemnation of notification that Dr. Johnstone and some others had seemed to infer. At the end of his paper he had expressed it as his opinion that, under certain circumstances, notification might prove of value in rural districts. There was just one other point he would refer to, and that was that it had struck him that those who had spoken in favour of notification had been careful to avoid all reference to the Table appended to the paper. This Table showed the results of five years' trial in seventy-seven districts, and the results, to his mind, almost warranted his conclusions.

A vote of thanks to the chairman brought the proceedings to a close.

CTURES AND DEMONSTRATIONS TO SANITARY OFFICERS.

INTRODUCTORY LECTURE

To the Twenty-Second Course.

EDUCATION, STATUS, AND EMOLUMENTS OF SANITARY INSPECTORS.

A. Wynter Blyth, Barrister-at-Law, M.O.H., St. Marylebone.

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ourse of lectures and demonstrations you are about to rt in have for their primary object the training of men men as soldiers and officers in the disease preventive ; an increasing army, whose campaigns endure for hose weapons are not Remingtons or Maxims, but in the leanliness, isolation, disinfection, and the natural and nt agencies of sunlight and fresh pure air.

public health, which forms the subject of the course of , is not a pure science like mathematics, physics, Che- or botany, but rather the application of many branches wledge to the promotion of healthy existence—to the g of premature death.

s present development hygiene is a thing of our own nt some of the more important mechanical and engi- appliances connected with drainage and water supply en in use ages ago. The modern archæologist uncovers ied streets of prehistoric cities, and rarely fails to find s which were evidently destined for the supply of pure and other conduits whose office was to conduct away uids. There is little doubt that whenever men collected r in walled cities, the more obvious foul collections were l by workers specially appointed for this office.

re trustworthy records exist, as in the case of Rome, ure glimmerings of a sanitary authority, of sanitary and regulations. Two thousand three hundred years ne established officers called Ediles; these Ediles saw to air of the network of Roman public sewers, the cleansing [illegible] abated public nuisances, [illegible]

[illegible] development is only to be [illegible] in the records of the large [illegible] more a matter of local than of [illegible] present system [illegible] of ancient civiliza[illegible] public health has been [illegible] in which more have [illegible] hostile weapons: by many an [illegible] in which the crews have been [illegible] Besides these lessons three forms of [illegible] the human race, viz., [illegible] specially taught local [illegible] the use of sanitary [illegible] officers.

[illegible] infectious form, raged at [illegible] the sixteenth and seventeenth [illegible] governing body of those [illegible] streets, of pollution [illegible] of the living in tenements, [illegible]

[illegible] computed that in six months [illegible] died of it in London. Half a [illegible] earliest manuals of hygiene, a [illegible] by a Dr. Mead, one of the [illegible] of that day. The treatise is entitled [illegible] Pestilential Contagion and the [illegible]

[illegible] Eastern malady, he recommended [illegible] in the ports and the enforcement of [illegible] things infected. The common [illegible] every household affected with [illegible] sick and healthy together, he [illegible] of inefficiency and inhumanity; [illegible] hospitals be established for the sick, [illegible] infected goods were to be buried or [illegible] recommended the establishment of a Council of Health. So far then as regards measures to be taken to avert an impending epidemic. At the beginning of the eighteenth century just views were held and similar principles inculcated, which are in the nineteenth century enforced by law; that is to say, separation of the sick from the healthy, a strict surveillance of the ports, the abatement of overcrowding, sanitary inspection and the destruction of grievously infected articles. Levantine plague is extinct in England, but there is

g in our climate or soil hostile to its invasion, as shown by
ccessive invasions culminating in the disaster of 1665.
the same squalid filthy surroundings plague imported
he East may even now spread and sustain its notorious
utation for fatality. The recent outbreak in Hong Kong
filthy Chinese Quarter and its spread from thence to
re matters of common knowledge and deep concern.

ll-pox, in its direst eighteenth century form, little inferior
ue in fatality, disfiguring those who died beyond recogni-
anding indelibly those who survived, excited in its way
error.

er's great discovery of vaccination was made, or at all
practised, in 1798. The truth and value of this
y has been attested by successive commissions of enquiry.
rity of the recent commission in their final report lay
pon the cumulative evidence all pointing to the conclu-
t vaccination has a protective effect in relation to small-
t is however not my intention to dilate upon vaccination
y mention it incidentally and as a part of sanitary
The disease was not only combated by vaccination but
isolation and disinfection, and its course has taught all
officers much.

however, to cholera that the sanitary officer is most
l for popular movements in aid of an efficient sanitary
We have had four great outbreaks of cholera: one
, a second in 1849, a third in 1854, and a fourth in
Each of these outbreaks has directly or indirectly
legislation, and stimulated local authorities into activity.
l outbreak, combined with observations on the general
e of fevers, stimulated an enquiry into the conditions
hich the masses of our population lived. The results
nquiry were published by the late Sir Ed. Chadwick in
orate volume, entitled "Report on the Sanitary Con-
f the Labouring Population of Great Britain." This
itiated the Royal Commission of 1843-5, and culminated
rst general Public Health Act, 1848.

in this brief sketch of a portion of sanitary history I
t omit the influence of statistical enquiry. The first
was taken in 1801. This, when combined with the
and causes of death, gave data for the statistician to
effect of sanitary measures, and it was soon recognised
ite irrespective of the infectious classes of disease, a
itary environment prevented general maladies—those
ad not hitherto been recognised as preventable—and
span of human life could be prolonged by the adoption
ry supervision and regulation.

It was also recognised that voluntary adoption of the principles of hygiene by the governing bodies of our towns—still less by individuals—was likely to be uncertain, spasmodic, and unsatisfactory; that the main principles of hygiene would have to be made more or less compulsory; and that there would necessarily have to be proper officers appointed, not here and there, but right throughout the land.

It was then somewhat in the way I have sketched out that the office of sanitary inspector originated. At first it appeared to many that the office required few qualifications, nuisances were confused with stinks, everything that smelt offensively was a nuisance, and the main object was to find out these smells, the sanitary inspector was a smeller, an inspector of stinks. This is I trust a thing of the past, the misleading name of inspector of nuisances is still retained in the older statutes, but in the more recent the title of sanitary inspector is substituted. The efforts made by this Institute by the establishment of examinations and of an educational course have abolished the inspector of stinks and replaced him by trained skilled observers, by men who though they may in some portion of the daily routine have to do lowly offices yet do them with lofty aims.

THE EDUCATION OF THE SANITARY INSPECTOR.

The amount of education a sanitary inspector requires depends so much upon the equipment the student starts with that no general rule can be laid down applicable to every individual.

The value of a sound preliminary education is obvious; a young man or woman with faultless spelling, clear handwriting, and a good general knowledge has an immense superiority over a person who from lack of opportunity or idleness writes and spells badly and possesses no technical knowledge.

Certain trades have a great advantage, for example, that of the builder or the plumber; a first-class builder has had to acquire a large amount of detail with regard to the construction of houses, and as to drainage he is accustomed to intricate calculations, and has therefore already learned matters which others will have to acquire; so again the plumber, he has spent many years in tracing out pipes, in devising it may be or in fixing sanitary apparatus, and therefore begins the study of hygiene on an excellent and practical basis.

A good inspector is a person of quick observation—the powers of observation differ widely. Those inspectors who are particularly keen, rapid observers will run through a house with eatest celerity; yet in those few minutes they will know at can be known about the sanitary structure and ap- es of that house by superficial inspection. If more is ed, that can only be obtained by excavations and by le tests. They will tell you the number of rooms—the d structure of walls, woodwork, stairs—the number of is, clean or dirty, directly connected or not—the nature iount of the sanitary accommodation—the disposal of dust ventilation of the soil pipe—and many other matters. the other hand, those who are not gifted with the faculty d observation, or have not been able to acquire it, will ertainly overlook some essential defect; defects which ight to have taken note of. Hence my first injunction ould-be sanitary inspector is to cultivate and train his ng powers, and to test them by writing from memory of any premises he may visit.

Institute attaches the utmost importance to teaching by of the senses. You may have to read pages of descrip- t, and then not quite understand what it is all about; , if you see and handle the thing itself, its use and is immediately manifest. Better than all, knowledge quired is not so easily forgotten as that learned by book. e who have entered for the course of lectures will have ortunity of studying on the spot the construction of works, waterworks, disinfection stations, healthy and l meat, laundries, common lodging-houses, shelters, and a few offensive trades. If these demonstrations are y taken advantage of they will replace much reading.

e Metropolis not only are there no end of object lessons streets, but there are also convenient collections of n museums illustrating sanitary science, as for example kes Museum and the Museum at Hornsey. I rejoice see that the chief towns are following the example, and ing Museums of Hygiene. Such a Museum as the Museum, at first entry, does not appear remarkably re; the exhibits require for the most part some study, e relics of a barbarous hygienic age, others are the velopments designed for health and comfort.

r as examinations can be made practical those of the e are so: models, plans, and drawings are placed before minee; mortars, cements, pipes, and sometimes speci- f healthy and diseased meat adorn the examination d strike no small feeling of dismay into the mere book

may come a time when some actual preliminary train- be required of candidates before they are permitted to receive their certificate of fitness. The only circumstance that has withheld the Institute from making such a regulation is the dearth of facilities for this practical training. In all the crafts, such as that of the carpenter, the plumber, the painter, a greater or longer period of service is necessary. In all the professions practical work is insisted on before admission into the ranks. Local authorities for the most part expect to be supplied by the Institute with Inspectors, and many of them imagine, because he or she holds the certificate, that they are perfectly fit to at once take up the duties of the office. All that is affirmed in that certificate is that the candidate has passed an examination in certain subjects, but some really require much experience before they make really good and useful Inspectors. Some Inspectors take pupils, sometimes with the knowledge of their Boards, more often without. The local authorities should give every assistance in their power, by freely allowing all sanitary inspectors to instruct aspirants practically in the duties. Another and perhaps more effectual way is to employ assistant inspectors at a small rate of wage. A few months of experience as an assistant inspector in any large centre of population will give at all events some insight into the nature of routine work.

Although the study of sanitary construction and appliances can be profitably pursued with but little reading, a certain amount of book study is necessary; for example, the laws relating to public health must be perused and certain parts committed to memory. The English sanitary law as a whole is far in advance of that of any other country. At the same time it is voluminous and in parts confusing and inconsistent. The multiplicity of statutes is becoming a serious evil. In my humble opinion present day legislation is more or less a legislation of compromise, it will not compare in clearness of definition in phraseology and in logical sequence with that of forty years ago. Consolidation of cognate Acts is from time to time effected, but immediately the scattered statutes are amalgamated successive sessions produce successive amending bills many of which pass into law and so in a few years the number before and after consolidation is about equal, the law has still to be laboriously dug out of heaps of printed papers. What is required for the sanitary law is true codification, and if the whole is to be thrown into a code subsequent amendments should not take the form of separate statutes but merely insertions or substitutions of articles in the code. So that year by year, just like bringing out editions of an old work, new editions of the code would be issued.

All the sanitary statutes save certain local Acts, and many ard works on the law are to be found in the library hed to this Institute. So again manuals of hygiene, of tics, of sanitary plumbing, of sanitary construction, and a er of works of reference are also in the library. Most of the als have been written by personal friends of my own, I am myself of publishing certain works; you will therefore understand why I decline to recommend any particular to the student. The best plan is to consult them all and read carefully the one which the student thinks is most d for his own requirements. Those who wish to keep elves *au courant* with the advances of sanitary science read as they are published the reports of the Medical tment of the Local Government Board. We also possess n excellent series of Journals; as for example, the l of this Institute appearing quarterly, the monthly l of the Society of Medical Officers of Health, and the ry Record which is issued weekly. Those who are ts will also find that there is an enormous mass of istic literature published in Europe; Germany, France, Norway, Sweden, and even Spain have all their hygienic s.

Sanitary Inspector cannot enforce laws that are beyond nprehension of the people, and that is why conferences ngresses, with sanitary exhibitions such as the Institute ely held at Newcastle-upon-Tyne, have such a distinct onal advantage, and are so valuable. They bring before lic the vast extent of the subject. Had it not been for operation, indeed, of the English public it would have npossible to have carried out the sanitary laws and regu- It is useless to attempt sanitary reform on a large and e scale in any nation unless the nation itself is educated the standard of appreciating it. One of the causes of ortunate war in South Africa, without a doubt, was the erstanding of the native races of our attempts to exter- rinderpest by slaying all cattle suspected of infection. tutored, uncivilized man who sees in epdemic and epi- he malignancy of an offended deity or evil spirit, cannot hend the efforts of the white man stored with centuries ledge, who has forsaken sacrifice and propitiatory offer- the more effective weapons of disinfection, of isolation, the destruction of carriers of infection. One of the t services that this Sanitary Institute has done is to ise knowledge. Here we feel the importance of dif- into the humblest cottage the eternal principles of of cleanliness, of the dangers that lurk in corrupt n tainted food.

[illegible] the course of lectures for [illegible] a formidable one—sanitary [illegible] infectious diseases, disin- [illegible] to meat supply, venti- [illegible] plumber's work, sanitary appliances, [illegible] The question naturally [illegible] want to know all these things? [illegible] large towns the duties of an [illegible] specialised, divided, distributed; to one [illegible] of the slaughter-houses: to another [illegible] his energies solely to factories and [illegible] out of the Canal Boats [illegible] chimneys: and so on. This [illegible] Medicine, science, the crafts and the [illegible] the concentration of individual [illegible] branch of knowledge. There [illegible] Scotch geologist who devoted a greater [illegible] forms of crystallization in which [illegible] in nature. He is stated to have had [illegible] back on his career, that "his studies had [illegible]" This concentration is, however, fatal to the [illegible] belongs to a subsequent period. A doctor [illegible] anatomy, chemistry, physiology, pathology, and various other "ologies," but afterwards he drifts along the [illegible] and attains a post in which his daily [illegible] relation to many of the earlier studies. My own knowledge of anatomy, tolerably decent in its day, but thoroughly rusty now, has had no application for the past twenty years, but I had to go through the common mill. So with the students of this Institute. They may not be able to apply all the things which they have here to learn, and to be examined in. Excess of knowledge does no harm. The human brain is not like a portmanteau—the more you put into it the less room for other things; but the more you put into the brain the more capable of receiving and retaining it appears to be.

A modern innovation is the advent of ladies in the ranks of sanitary inspectors, this is not alone due to the upward movement of woman, her assertion of independence and quite legitimate demand to be permitted to earn her own living on an equal footing with man, but it is due to a real public want. So long as there are crèches, infant schools, nursing homes, large industrial institutions employing female labour, public sanitary conveniences for women, the female inspector will have ample scope for useful employment. Those who have been appointed have been an undoubted success, each year they are increasing

mber; the increase is, it is true slow, so slow that it by no
s follows that any lady passing the Institute's examination
btain office within a reasonable time; the vacancies are
y disproportionate to the candidates—many are called, few
n. Hence at present in this department success will,
than is usually the case, depend on influence, opportunity,
ood fortune. Let those who live in hope console them-
there are few officers in the service but who have been
times disappointed; a first post is always difficult because
ndidate can rarely claim experience, after the first post a
l and better paid one may be more easily obtained.

he advent of ladies is an event, so also is the greater
of a distinctly higher educated class of men in the ranks
itary inspectors. These two circumstances are raising
ass in public estimation, while at the same time the
ture is exalting the function and adding to the respon-
of the sanitary officer. In the past the Institute has
d no opportunity of improving the status and increasing
ficiency of the inspectorial staff, and for this the certi-
inspector should I think be grateful, indeed, in my
the highest interests of the certificated inspector is
up with and identical with those of the Institute. Any
of confiscation, of undesirable amalgamation, any
t to deprive the Institute of a position which it has
d, not by self assertion, but by good, hard, honest work,
such attempt succeed, cannot fail to affect injuriously
erests of the inspectors. Upon those who have received
irst stimulus in hygienic education within these walls a
duty is laid of supporting the Institute and opposing any
ion of its privileges, any hostile endeavour to restrict its
of beneficent action.

relationship of the Sanitary Inspector to the Medical
of Health has been, in certain districts, a burning ques-
nd one which requires careful treatment and delicate
ration. So far as the Public Health Act, 1875, is
ned, and so far as the Order of the Local Government
defining the duties of the two officers is concerned, no
relationship of the one officer to the other is laid down.
lationship is left to the local authority. In a great
ion of instances they are perfectly independent officers—
spector of Nuisances making his reports direct to the
ity, and being, as in the case of the health officer, elected
Board, and accountable to the Board, and to the Board
In a large number of London districts, and in many
ial towns, the health officer is actually a chief, and is
ible; the inspectors make their reports to him, and, save

in some special instances, make no reports direct to the Board. I have worked under both systems, and personally have found no inconvenience from either. There has never been the slightest friction; but we have not to consider what we would like ourselves, but what is best for the public service. Taking everything into consideration, I believe it is to the interest of the whole service that the two offices should not be independent, but that the health officer should be the chief inspector. In any case there should be a very definite understanding. It is inconvenient, and leads to scandal, if two officers should make diametrically opposite recommendations to the same authority. Directly officers disagree it is bad for both sides; soiled linen should be washed in private, not in public.

One of the greatest dangers to public health, and to true progress in sanitary matters, is over-zeal on the part of inexperienced officers. A man, after passing the examination of the Institute, with his head crammed with the statutes, with a theoretical knowledge of what are good and what are bad sanitary appliances, obtains an appointment, and attempts to revolutionize suddenly and violently the whole of the bad habits of the people, and the faulty construction of ancient houses; he acts according to the spirit and not according to the letter of the law. Case after case is taken before the magistrate, and case after case is lost. He has to learn the hard lesson, that there are hosts of things which ought to be put right, but that there is no real power to put them right. It must ever be remembered that the Public Health Acts only deal with coarse tangible nuisances, and that harm rather than good is done by any attempt to give large interpretations to the text. It is therefore a good rule to never attempt to give a notice unless the facts in the first place are absolutely certain, and in the next place, that the facts will be likely to ensure a conviction in a police court when the case is properly fought out against opinions and evidence which are likely to be brought by the defendant. Constantly in our courts, cases come before magistrates which, on investigation, have an entirely different complexion to that which they wore on being presented to the local authority. The officers are in this way discredited, and the sanitation of a district hindered. You cannot always apply the same rules to old property that you can to new; you have often to wait for many things which come in time of themselves. For example, premises may be in a very unsatisfactory state, but if you have ascertained that the lease will fall in within a twelvemonth, and that the house will then be pulled down, surely it is more prudent and far more effectual to wait until the end of the term. At all events in St. Marylebone is the practice, and one I think that is well worthy of .tion.

THE EMOLUMENTS OF THE INSPECTOR.

ie emoluments of the Inspector are not large, they vary a bare living wage in rural districts to say £350 a year wns, but such a salary as the latter is rare, quite excep-!. In the metropolis few inspectors get more than £3 10s. eek, a number much less. The post is therefore, so far as ' goes, not too attractive. When it is considered how nsible the duties of an inspector are, what a considerable nt of knowledge he has to apply, what temptations of y a poor man may have to withstand, when these matters ken into consideration, the emoluments as a whole are nly too low. It is a great error in policy to under-pay : servants. Ratepayers rarely feel the salaries paid to employés, the amount of the whole sanitary rate as a rule an insignificant proportion to the large amount levied for purposes. However low the present average rate of wage e it is higher than a few years back; local authorities are ning to appreciate the services of the sanitary staff, so here is ground to hope for better things. The common of our local administrators will in the end find that the economy is to get the best officers available, and when ave got good men to retain them by just and even liberal nent.

t a few closing observations. The qualifications of a ry inspector are good health, personal activity, the faculty dy observation, an even temper, an ever courteous manner, ssness of infection, and a requisite knowledge of the ique pertaining to his office.

those who think that wealth should be the highest aim, se to whom hard work is distasteful, to those who dread ion, my advice is "Pass on!" But those who have ate wishes, and whose ambition it is to be useful to their ' citizens, those who believe in the sanctity of human life, the possibility of averting and preventing diseases which re, or blind, or maim, or kill, will be welcomed as pro- recruits in the preventive army.

REVIEWS OF BOOKS.

THE THEORY AND PRACTICE OF HYGIENE.*

This volume is founded on the work of the late Dr. Parkes work well known to many generations of students, and for ov quarter of a century the standard work on Hygiene in the Eng language. Dr. Parkes' work after his death in 1876, was ed for several editions by the late Professor de Chaumont, and on decease by his successor in the chair of Hygiene at Netley, I Lane Notter. Altogether eight editions of "Parkes' Hygiene" l run their successive courses. Dr. Parkes' original writings v primarily intended for the use of military and naval medical offi the sanitary advisers of the Army and Navy. But the work ha far larger circulation, almost from its commencement, than amo the limited côterie for whom it was originally intended. It largely consulted by the medical profession and by the public anx for authoritative information on matters relating to personal public health. This followed not only from the high professi position of the author, but also from the recognition that was ev where given to the exceeding value of his researches into many jects of physiological and hygienic importance, to the clearness of views and the admirable lucidity of their expression, to the emi fairness of his judgments on controversial matters, and above al the manifest spirit of "seeking and desiring the truth" which characteristic of all Dr. Parkes' writings. The result of Dr. Pa labours was a work which was not only the pioneer of the sani literature of the century, but also served as a model of the methods of compilation of technical works of this character, which will for ever be regarded as a fitting monument to a man w name will always be associated with the highest triumphs of a sci which he did so much to cultivate.

Whilst many will deplore that the long and honourable caree "Parkes' Hygiene" is now by force of circumstances closed, all admit that Drs. Notter and Firth have given us in its place a v fully worthy to succeed it as the recognised text book for stud and practitioners. The lapse of time since Dr. Parkes first put l to pen, and all that has been done in the field of sanitary sci during that time, are sufficient justification of the view taker Professor Notter that any attempt at mere revision or re-edi of Parkes' book would be inadequate for the requirements of the ti New sciences even have sprung up since Parkes' death, of w even he could have had but a foreshadowing in his mental discernm Bacteriology has introduced an element of precision into a sci which was formerly much influenced by vague generalities traditional theories. Methods have changed not less than theo

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* The Theory and Practice of Hygiene, by J. Lane Notter, M.A., M.D.(D and R. H. Firth, F.R.C.S. 8vo. 1010 pp. J. & A. Churchill. 1896. Price

rinciples of practice have been evolved which were unknown to
;. There has been change, there has been advancement all along
ie, and to accurately describe the principles and practices on
modern Hygiene is founded it was necessary to write a new

elaborate review of Drs. Notter and Firth's book is hardly
d. It will be found without a doubt to be a worthy successor
great predecessor, and will add largely to the already high
ion of its authors. Necessarily it contains articles on many
s that are not to be found in the old Parkes, but each one
pensable to a proper knowledge of Hygiene. Whilst there has
o undue compression, there is certainly no padding, and the
ges which the work contains are as replete with information as
t insatiable student could desire. We anticipate a prosperous
for "Notter and Firth's Hygiene," and a success equal to
ts.

L. C. P.

NOTES ON BOOKS AND PAPERS IN TRANSACTIONS.

nstitution of Civil Engineers. Minutes of Proceedings."
CXXVII. 1896-7. Part I.

ined in these Proceedings is a paper (with discussion upon
r. Percy Frankland, on the Bacterial Purification of Water.

g "Abstracts of Papers in Scientific Transactions and Period-
e:—

ollution of the Harbour of Kiel, by Dr. B. Fischer (Zeit-
ür Hygiene, 1896, p. 1).

ealth of Workpeople engaged in the Baltic Ship Canal, by
edder (Deutsche Vierteljahrschrift für öffentliche Gesund-
ge, 1896, p. 577).

Water Supply of Arlon, by F. Englebert (Annales de l'As-
d'Ingénieurs sortis des Écoles spéciales de Gand, 1895-6,

val of Iron from Well Water, by A. Lübbert (Zeitschrift für
, 1896, p. 398).

ry Enactments for protection against Mercurial Poisoning,
nann Wittzach (Deutsche Vierteljahrschrift für öffentliche
eitspflege, 1896, p. 612).

tion and Drainage Works in Probolingo, by A. G. Lamminga
rift van het koninklijk Instituut van Ingenieurs, 1894-5,

[illegible]

[illegible] L.

[illegible]

[illegible] L. Livesey; [illegible] Transactions and [illegible]

[illegible] Schweizerische [illegible]

[illegible] through Peat, by [illegible] 1896, p. 345,

[illegible] pp. 8vo. [illegible]

[illegible] appear among others in [illegible]

[illegible] by Percy Griffith.

[illegible] Thudichum.

[illegible]

[illegible] Part I.—Ventilation, [illegible] By W. H. Maxwell. 89 pp, [illegible] London, [illegible]

[illegible] which appeared [illegible] illustrated and deal with [illegible] and other amounts [illegible] artificial ventilation, [illegible]

MEETINGS HELD APRIL TO JUNE, 1897.

SESSIONAL MEETING.

A meeting was held on April 7th, when a discussion was opened by H. Kenwood, M.D., D.P.H., F.C.S., on "The Notification of Measles." Dr. E. B. Forman, Chairman Public Health Committee, London County Council, in the chair. About 60 Members, Associates, and Visitors attended. (See page 161.)

EXAMINATIONS.

xamination in Practical Sanitary Science, held at Birming-
pril 9th & 10th, 1897, 5 Candidates presented themselves.

owing Candidate was granted a Certificate in Practical
cience :—

10. **Salt, Arthur**, 17, Oliver Street, Birmingham.

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xamination for Inspectors of Nuisances, held at Birming-
riday and Saturday, April 9th and 10th, 1897, 44 Candi-
nted themselves.

lowing 26 Candidates were certified, as regards their
nowledge, competent to discharge the duties of Inspectors
es :—

10. **Aris, Algernon Sidney**, 31, Smith Street, Bloomsbury, Birmingham.
10. **Atkinson, Edward H.**, 32, Marshfield Road, Goole.
10. **Baker, Frank**, 29, Chapel Street, Wath-on-Dearne, near Rotherham.
10. **Beacham, William Ernest**, Bridge Street, Abercarn, Monmouth.
10. **Blundell, Tom**, 28, Hall Road, Handsworth, Birmingham.
10. **Clifton, Charles Henry**, 81, Union Street, Tipton.
10. **Gander, Charles James**, 24, High Street, Evesham.
10. **Hargreaves, Elijah**, 32, Adelaide Street, Crawshaw Booth, Rawtenstall.
10. **Howard, Samuel**, Rake Lane, Bromborough, Cheshire.
10. **Hutchinson, Miss Harriet Jane**, Fern Bank, Corporation Oaks, Nottingham.
10. **Ingham, Joseph Sharpe**, 77, Skipton Road, Colne, Lancashire.
10. **Jones, Edwin William**, 108, Bloomfield Road, Tipton, Staffordshire.
10. **Linford, Arthur Banks**, Wombwell, nr. Barnsley.
10. **Moore, Ernest William**, 9, Bath Parade, Cheltenham.
10. **Nightingale, John**, 3, Clarence Street, Manchester.
10. **Norton, Charles Henry**, 5, Preston Street, Middleton, Manchester.
). **Oakes, Edward**, 24, Waterworks Street, Bootle.
). **Phipps, Frederick Reginald**, 64, High Street, Tewkesbury.

1897, Apr. 10. Price, George, Station Road, Harborne.
1897, Apr. 10. Roberts, John, Midland Truant School, Lichfield.
1897, Apr. 10. Sainsbury, George Henry, 9, Grimshaw Street, Turncroft Lane, Stockport.
1897, Apr. 10. Tunna, Joseph, 71, Holme Street, Smithdown Road, Liverpool.
1897, Apr. 10. Weir, Ralph William, 42, South Frederick Street, South Shields.
1897, Apr. 10. Woollam, William Edward, Bargates, Whitchurch, Salop.
1897, Apr. 10. Wright, Samuel Dennis, 83, Lower Villiers Street, Wolverhampton.
1897, Apr. 10. Younger, Edward George, M.D., D.P.H., 19, Mecklenburgh Square, W.C.

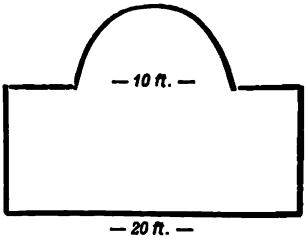
Examination Questions.

Practical Sanitary Science.—Birmingham, April 9th & 10th, 1897.

Paper I.

1. How is rain-water stored and filtered for delivery to towns?

2. Find the cubic contents of a room 20 ft. square and 12 ft. high, having a flat ceiling, with a hemispherical dome in the middle 10 ft. in diameter.



3. What provisions are desirable with regard to window space in living-rooms? State the sanitary advantages and disadvantages of the various kinds of windows in general use. In what way can any of these forms of windows be adapted for the purpose of ventilation?

4. State the relative advantages and disadvantages of heating by open fireplaces and by stoves. Describe and sketch a good form of open fireplace and a ventilating close stove.

5. Name four soils and compare their advantages or disadvantages as sites for dwelling houses. Would the stratum immediately underlying the soil affect the question?

Paper II.

6. What is the object of a "damp-proof course"? Give sketches showing in what position it should be placed to meet various conditions, and state the materials of which it may be constructed.

7. Draw in section, to a scale of 1 inch to a foot, walls of the following materials:—*(a)* Brickwork, English bond, 1 brick thick and 2 bricks thick; *(b)* Brickwork, Flemish bond, 2 bricks thick; *(c)* Stone rubble; *(d)* Concrete.

escribe and give a sketch plan of the drainage of a cowshed
s built upon a clay soil, 25 ft. from a stream, which must not
ited, and where there is no sewer available.

escribe the methods used for jointing iron pipes, and for
; stoneware pipes. How may iron pipes be protected from
n? In what circumstances are iron pipes preferable to stone-
pes?

)escribe, with sketches, the best methods of providing for
e from w.c.'s, sinks, baths, and rain-water pipes. What
ments should be made to prevent sewer gas entering into
gs?

The Candidates were examined vivâ voce *on the* 10*th*.

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ctors of Nuisances.—Birmingham, April 9th & 10th, 1897.

hat are the provisions of the Public Health Act, 1875, with
o the exposure of infected persons and things?

hat is the law as regards the sale of horseflesh and of marga-
How would you distinguish between horseflesh and oxflesh?

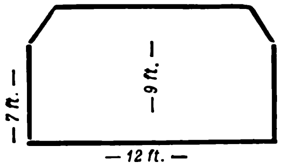
hat is the difference between a "Common Lodging House"
"House let in Lodgings?" State briefly the duties of an
r in connection with each.

hat are the chief provisions of the Model Bye Laws of the
overnment Board with regard to the construction of privies
pools in connection with new buildings?

hat are the Chief points laid down in the Regulations of the
overnment Board under the Canal Boats Act, 1877, with
o cubic space, ventilation, offensive cargoes, removal of bilge
nd water supply?

hat are the rules with regard to the construction and man-
t of slaughter houses which it is most important to enforce,
what neglect of these rules are they most often rendered
ly offensive?

That is the amount of air space
om 16 ft. long, 12 ft. wide, 7 ft.
the wall plate, and 9 ft. high to
ing, the pitch of the roof being
hown in the accompanying sketch
of one end of the room?



hen inspecting houses, to what points would you direct your
n to ascertain whether the drainage is in proper condition?
re the methods in use for ascertaining defects in house
s?

The Candidates were examined vivâ voce *on the* 10*th*.

At an Examination in Practical Sanitary Science, held in London, on May 7th and 8th, 1897, 25 Candidates presented themselves.

The following 12 Candidates were granted Certificates in Practical Sanitary Science:—

1897, May 8. Adams, Stephen Isaac, Ravenhurst, York Road, Southend-on-Sea.
1897, May 8. Bradley, Francis William, Cockfosters, near New Barnet, Herts.
1897, May 8. Coller, Edward Henry, Cromwell House, Berners Street, Ipswich.
1897, May 8. Costain, William Percy, Byron Road, Blundellsands.
1897, May 8. Jarman, Frank Wilmot, 4, High Street, Croydon.
1897, May 8. Knight, William Henry, 12, Ferrestone Road, Hornsey, N.
1897, May 8. Morrison, Alexander, 11, Osborne Terrace, Edinburgh.
1897, May 8. Sanderson, John, 15, St. John Street, Islington, N.
1897, May 8. Styles, Arthur, 19, Monson Road, New Cross, S.E.
1897, May 8. Turriff, Acton Alexander, 3, Belmont Street, Aberdeen.
1897, May 8. Walkden, Samuel, Downside, Whitchurch, Tavistock.
1897, May 8. Wigley, Alfred, 97, Newington Green Road, N.

At an Examination for Inspectors of Nuisances, held in London, on Friday and Saturday, May 7th and 8th, 1897, 123 Candidates presented themselves.

The following 63 Candidates were certified, as regards their Sanitary Knowledge, competent to discharge the duties of Inspectors of Nuisances:—

1897, May 8. Abbott, Alfred Ernest, The Square, Wolverton, Bucks.
1897, May 8. Anning, John Taylor, Wadham House, Wentworth Street, E.
1897, May 8. Banks, Thomas, 79, Howard Street, Coventry.
1897, May 8. Baxter, John T., 101, Gowan Avenue, Fulham, S.W.
1897, May 8. Bemister, Francis, Station Hospital, Guards' Depôt, Caterham.
1897, May 8. Billing, Miss Alice Sarah, 179, Ham Park Road, Forest Gate, E.

8. **Bonus, Henry Pem**, 44, Hopton Road, Streatham.
8. **Brewer, Ernest Augustus Gordon**, 217, Peckham Rye, S.E.
8. **Brown, Gilbert George**, 63, Stoke Road, Guildford, Surrey.
8. **Browne, Alfred Willis**, 15, Crescent Road, Plumstead, S.E.
8. **Bull, Bernard**, 144, Handcroft Road. Croydon.
8. **Butler, Harold Herbert Fry**, 12, Newby Place, Poplar, E.
8. **Clegg, Warren Leach**, Harefield Cottage, Heywood.
8. **Dodd, Frederick Joseph**, 37, Chrisp Street, Poplar, E.
8. **Dooley, James**, Fern Villa, Ellison Road, Streatham.
8. **Dowsett, Charles Frederick**, 38, Henry Street, Deptford.
8. **Elgar, Frederic Samuel**, Nyewood, Bognor, Sussex.
8. **Farran, Arthur**, 88, Winchester Road, Colchester.
8. **Fawcett, Thomas Henry**, 26, Paragon Road, Blackheath, S.E.
8. **Flint, Ernest William**, Lee House, Coventry Street, Brighton.
8. **Freeman, Albert**, Rickmansworth, Herts.
8. **Green, Walter Herbert**, Montana, St. Mary's Grove, Chiswick.
8. **Hill, Thomas**, 1, Clarendon Street, Harrow Road, W.
8. **Isbell, Archie**, North Street, Fowey, Cornwall.
8. **Jones, Walter William**, 49, King's Road, St. Leonards-on-Sea.
8. **Landen, James**, 1, Archway Villas, Archway Road, Holloway, N.
8. **Manley, Miss Gulielma**, 52, Park Lane, Croydon.
8. **Mansfield, Edwin Albert**, 1, Aldermanbury Buildings, E.C.
8. **Martin, Ebenezer**, 2, Lausanne Rd., Peckham, S.E.
8. **Meadway, Frederick William**, 354, Bethnal Green Road, E.
8. **Mettam, Henry**, 1, Stanway Terrace, Parkeston, Essex.
8. **Mossop, Thomas**, 31, Bruce Grove, Nottingham.
8. **Nicholls, Ernest May**, 2, Elm Villas, Albacore Crescent, Lewisham.
8. **Norton, John Barker**, Leeds and Calcutta.
8. **Northcote, William Thomas Hawken**, 8, St. Leonard's Terrace, Bodmin, Cornwall.
8. **Oldfield, Frank Stanley**, 25, Coborn Road, Bow, E.

1897, May 8. Pearson, John James, 4, Brunton Place, Warwick Road, Carlisle.

1897, May 8. Potterton, Albert Belton, 122, Cavendish Road, Balham, S.W.

1897, May 8. Powell, George Richard, 56, Maison Dieu Road, Dover.

1897, May 8. Prosser, Ernest Charles Camp, 2*a*, Dudley Street, Luton.

1897, May 8. Punch, John, New Street, Sedbergh, Yorkshire.

1897, May 8. Punnett, Alexander William, St. Margaret's, Tonbridge.

1897, May 8. Quirk, John Joseph, 15, West View, Peel, Isle of Man.

1897, May 8. Rainbird, Ernest Morris, 57, Biggin Hill, Upper Norwood, S.E.

1897, May 8. Richards, Daniel Elwyn, 97, Grandison Road, Clapham Common.

1897, May 8. Richings, Miss Ethel Maud, St. Clement's Rectory, Worcester.

1897, May 8. Robertson, Miss Monica L. M., Ladykirk, Harrow-on-the-Hill.

1897, May 8. Robinson, George, Tatenhill, Burton-on-Trent.

1897, May 8. Rye, Frederick George, 63, Paradise Street, Rotherhithe, S.E.

1897, May 8. Smith, Herbert Sydney, Rayleigh, Essex.

1897, May 8. Stephens, Henry Salter, 228, New North Road, Islington, N.

1897, May 8. Stoakes, Harry Adrian Taylor, W.L.D. Schools, Ashford, Middlesex.

1897, May 8. Sturgess, Miss Emma Elizabeth, 72, Canfield Gardens, N.W.

1897, May 8. Thick, Franklin Frank, Holborn Infirmary, Archway Road, Upper Holloway, N.

1897, May 8. Thresh, Miss Gertrude May, Spergula, Chelmsford.

1897, May 8. Vigar, Frank Henry, 123, Page Street, Westminster, S.W.

1897, May 8. Watson Matthew, Piercebridge, Darlington.

1897, May 8. Wetjen, William George, 55, Park Road, West Ham, E.

1897, May 8. White, John, 19, Walker Street, Limehouse, E.

1897, May 8. Willett, Alfred James, 247, Bethnal Green Road, E.

1897, May 8. Wood, Alexander, 18, Lambert Road, Custom House, E.

1897, May 8. Wood, Walter William, 155, Fort Road, Bermondsey, S.E.

1897, May 8. Wooster, Bertrand Edward, Bledlow, Tring, Bucks.

Examination Questions.

Practical Sanitary Science.—London, May 7th and 8th.

Paper I.

Describe the principle and action of a mercurial barometer.
nuch heavier is mercury than water, and at what height will a
n of water be balanced by the pressure of the atmosphere?

Jpon what conditions do the fluctuations of ground air and
l water depend? In what way do ground air and ground
affect the healthiness of dwelling houses?

escribe fully the best form of domestic filter with which you
uainted, its method and rate of action, and its effects on water
through it.

That would be the internal dimensions of hollow cubes con-
respectively 300 and 1,000 cubic feet of air space? Why is
ea in inhabited rooms important?

Paper II.

numerate the different methods of artificially heating living-
describing in each case the changes they may produce in the
he rooms.

ate the general provisions of the statute law providing for the
nt of smoke nuisances.

scribe the manufacture and methods of testing Portland
Of what geological formation is Portland stone? Specify
position of good Portland cement concrete.

hat is the object of an oviform section of sewer, and how is
aulic mean depth of flow determined?

The Candidates were examined vivâ voce *on the 8th.*

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spector of Nuisances.—London, May 7th and 8th, 1897.

u are asked to collect—

a) A sample of milk at a railway station which has been consigned by a farmer suspected of watering his milk;

b) A sample of "butter" suspected of being partially or entirely margarine. State exactly the steps you would take, and the points you would note in each instance.

hat are the characteristic appearances of good meat? What are the differences that may be observed between ox-flesh an flesh? Under what conditions may the latter be exposed for

3. A slaughterhouse has been reported to a Sanitary Auth a "nuisance." Explain in detail the steps you would take, various points to which you would direct your attention i to ascertain its sanitary condition.

4. What methods of disinfection or cleansing should be in the following cases:—

(*a*) A stable in which a horse had died of Glanders;

(*b*) A cowshed from which a comsumptive cow ha removed;

(*c*) A railway truck that had been used for conveying t of animals having had Anthrax?

5. Make a sketch to show a good arrangement of beds in tory for twenty adults. State the dimensions you would pro such a dormitory and the means for its effectual ventilation.

6. What causes may produce the pollution of water in a w a house, and how can this pollution be prevented or remedied cribe how water may be deteriorated—

(*a*) In a running stream;

(*b*) After storage;

(*c*) In the course of distribution.

7. If water is flowing full-bore through a pipe three diameter at the rate of three feet per second into a tank diameter and eighteen inches deep, how long will it take to tank? How many gallons will the tank contain?

8. Discuss the relative value and applicability of the smoke the water test for the internal sanitary fittings of a house, an underground drains.

The Candidates were examined vivâ voce *on the 8th.*

At an Examination in Practical Sanitary Science, held on June 18th and 19th, 1897, 3 Candidates presented the to whom Certificates were granted.

1897, June 19. Cotterill, William Henry, 108, The Nottingham.
1897, June 19. Norton, John Barker, 1, Spencer Place, and Calcutta.
1897, June 19. Parker, Howard, Moorlands, Buxton, Der

t an Examination for Inspectors of Nuisances, held at York riday and Saturday, June 18th and 19th, 1897, 43 Candidates ented themselves.

he following 25 Candidates were certified, as regards their tary Knowledge, competent to discharge the duties of Inspectors uisances:—

, June 19. Bains, George Skipsey Liddel, 23, Frederick Street, South Shields.
, June 19. Bawden, William Henry, 6, Poplar Grove, Dingle, Liverpool.
, June 19. Cannell, John Herbert, 4, Mona St., Liverpool.
, June 19. Crosby, James, 3, Thurnham Street, Liverpool.
, June 19. Dalby, Francis, 15, St. Stephen's Road, Rotherham.
, June 19. Dobson, Robert, Sellett Hall, Milnthorpe.
, June 19. Dodd, John George, Colwell, South Farm, Barrasford, Hexham.
, June 19. Emery, William, Station Lane, Wingate R.S.O., Durham.
, June 19. Gardner, Thomas, Market Street, Ulverston.
, June 19. Garrett, Albert Edward, 16, South View, Great Harwood, Blackburn.
, June 19. Hailstone, Thomas Henry, 85, Chelmsford Street, Attercliffe, Sheffield.
, June 19. Hugall, Ralph Halliday, 56, Hendon Road, Sunderland.
June 19. Marshall, William Henry, 209, High Street E., Sunderland.
June 19. McIntosh, Harold Blyth, 6, Bohemia Terrace, Finsbury Street, Hull.
June 19. Mitchell, Herbert, Fern Cottage, Ordsall Moor, near Bradford.
June 19. Shaw, Alfred Cresswell, Glebe Farm, West Boldon.
June 19. Smith, Robert, 11, Whittaker Street, Radcliffe, Manchester.
June 19. Stoker, Nicholas, Bedlington Colliery, Northumberland.
June 19. Vaughan, John Oliver, 84, Mayfield Street, Spring Bank, Hull.
June 19. Walker, Stead, Hickleton, Doncaster.
June 19. Webster, John, 28, Bradewell Street, Kirkdale, Liverpool.
June 19. Whitehead, Thomas, Spring Bank House, High Street, Lees, near Oldham.
June 19. Wilkinson, Robert, 3, St. Edmund's Place, Gateshead.
June 19. Willcock, James, District Council Offices, Walkden.
June 19. Wilson, James, 2, Rock Terrace, Hendon, Sunderland.

Examination Questions.

Practical Sanitary Science.—York, June 18th and 19th.

Paper I.

1. At what temperature does water boil at the level of the sea? Why does it boil? And is there any relation between that fact and the height to which an ordinary pump will lift water? If so, explain it.

9. How is rainfall calculated? How should a rain-gauge be constructed? What is the average rainfall in England? What is the ratio between rainfall and percolation through different strata?

3. Describe in detail the conditions which have to be observed to prevent the pollution of the domestic water supply within a dwelling.

4 Name the different kinds of bricks used in building. What are the relative advantages of each?

Paper II.

5. Describe some system of warming and ventilation of a hospital, asylum, or public building, on a natural (as distinguished from a mechanical) principle, explaining the methods for the admission of pure and the extraction of vitiated air.

6. What are the legal duties of a private individual with regard to a dangerous infectious disease—*e.g.*, scarlet fever—attacking a member of his family?

7. Draw to scale of 1½ inches to 1 foot the following traps: Disconnector, Dubois, Anti D., D., Bell, Dip.

8. A house-drain is 40 feet in length, 6 inches in diameter, and falls 1 in 20; at its upper end is a vertical pipe 4 inches in diameter. How many gallons of water will be required to fill the drain and vertical pipe to the level of 4 feet above the invert of the drain at its lower end?

The Candidates were examined vivâ voce *on the 19th.*

Inspectors of Nuisances.—York, June 18th and 19th.

1. What are nuisances as enumerated under the Public Health (London) Act, 1891, and the Public Health Act, 1875?

2. What steps should be taken by a Sanitary Officer in the event of *Typhus* fever breaking out in a crowded neighbourhood?

3. Explain in detail any one process of disinfection of clothing.

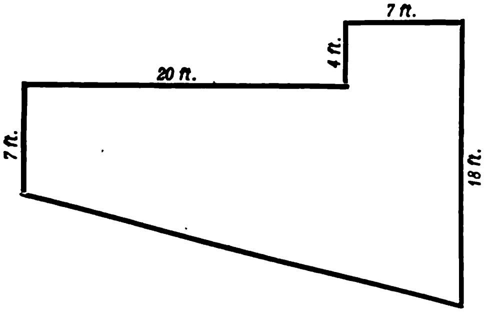
4. Under what circumstances can you seize a living animal as unfit

food? Can you detect measles in a living pig? If so, how ld you set about it?

What are the regulations made by the Local Government 'd under the Canal Boat Acts?

Mention the chief causes of pollution of a water supply within a ling. What points should be observed in constructing and fixing 'ern?

What is the capacity of a shop of the shown in plan, 3 feet in height? many persons be allowed to y it—(a) in ime, (b) during ime?



Describe how you would lay a drain of stoneware pipes in ich already made, and how the joints should be made. How you test the drain when completed?

The Candidates were examined vivâ voce *on the 19th.*

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an Examination in Practical Sanitary Science, held at Bristol ly 2 and 3, 1897, 5 Candidates presented themselves, to 3 of Certificates were granted.

July 3. **Farmer, Henry James**, 27, Sydenham Road, Bristol.
July 3. **Hale, Edward John**, 343, Wightman Road, Hornsey, N.
July 3. **Masters, William James**, 49, Oldfield Road, Birmingham.

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in Examination for Inspector of Nuisances, held at Bristol on 'and Saturday, July 2 and 3, 24 Candidates presented them-

following 12 Candidates were certified as regards their ry Knowledge Competent to discharge the duties of Inspector sances.

July 3. **Biggs, Percy Nonus**, 44, St. Michael's Hill, Bristol.
July 3. **Crocker, Jonas**, 88, Salisbury Street, Blandford, Dorset.

1897, July 3. DOWNS, FREDERICK JOHN, St. Agnes' House, Newfoundland Road, Bristol.

1897, July 3. GOULD, HENRY CHARLES, Monmouth Street, Topsham, Exeter.

1897, July 3. HURLEY, FREDERICK JOSEPH, 10, Bridgend Road, Aberkenfig, R.S.O., Glamorgan.

1897, July 3. HARRIS, CHARLES FREDERICK, 12, Manor Street, St. Paul's, Bristol.

1897, July 3. KIRLEY, FRANK, 30, Falmouth Rd., Horfield, Bristol.

1897, July 3. MAPLETON, HENRY BANBURY, M.B., D.P.H., Wonwell, Highweek, S. Devon.

1897, July 3. MILLARD, GEORGE AUGUSTUS, High Street, Chipping Sodbury, Gloucester.

1897, July 3. PADFIELD, FRANK, 1, Water Works, Abertillery, Mon.

1897, July 3. PRITCHARD, CHARLES WILLIAM, 157, Fowler Street, Sheffield.

1897, July 3. WILLIAMS, JOHN, 29, Mill Street, Tonyrefail, near Porth, Glamorgan.

Examination Questions.

Practical Sanitary Science. Bristol, July 2nd and 3rd, 1897.

PAPER I.

1.—What are the component parts of (*a*) pure atmospheric air, (*b*) pure water? What are the usual sources of contamination of air and water in dwelling-houses? What is the natural law as to the diffusion of gases?

2.—A ventilating shaft is 50 ft. high and 18 ins. square: how much air would ascend through it per minute when the temperature at the bottom is 20° Fahr. greater than that of the atmosphere?

3.—What is meant by the terms "Hydraulic mean depth"—"Head of pressure"—"Specific gravity"—"Capillarity"—"Absorption"?

4.—A reservoir is 30 ft. in depth: what is the pressure on the bottom of the retaining wall in pounds per square foot, and at what depth is the centre of pressure?

PAPER II.

5.—What are the chief causes of contamination of the subsoil of dwellings, and how can they be avoided?

6. Describe the properties and use of the following materials:

Portland cement.
Chalk lime
Asphalte.
Oolites.
Lias lime.
Hair mortar.
Sandstone.
Granite.

7.—What powers have a Rural Sanitary Authority to make By-

, and in respect to what nuisances are these limited? Can the l Government Board increase these powers, and if so under Act?

-Describe the proper construction and fitting-up of a valve closet and a short hopper closet, detailing the manner in which ater should be supplied, and the way in which the discharge should be dealt with.

The Candidates were examined vivâ voce *on the 3rd.*

Inspectors of Nuisances.—Bristol, July 2nd and 3rd, 1897.

-What do you know of tuberculosis and foot and mouth disease cting milk and meat?

-What are the main defects you would look for if called upon ect a dwelling-house in which typhoid fever had occurred?

-What nuisances are you likely to meet with in the inspection nal boat? How would you deal with them?

-What are the special sanitary points to be attended to in the uction of—

(*a*) An underground bakehouse?

(*b*) A bakehouse above ground?

-There is a suspicion that there is a leakage in a certain house in proximity to a well, which allows sewage to find its way into ll; what steps would you take to ascertain if this is the case?

-How many gallons of water could be collected annually from of of a house, the ground plan of which is 35ft. by 25ft., the l rainfall being 27 inches? Would this give sufficient water mestic purposes for a household of five persons?

-A room 9ft. high, 20ft. long, and 10ft. broad contains six s. The ventilating inlets, four in number, have a total area of uare foot. With what velocity per minute will the air have to through the inlets, to supply 3,000 cubic feet per head per hour? l the conditions given be satisfactory for a dormitory or g room?

-Describe the construction of a disconnecting manhole chamber house drain, the drain being 7ft. below the surface. Give a

The Candidates were examined vivâ voce *on the 3rd.*

ADDRESS TO THE QUEEN.

Presented by the Council of the Institute.

TO THE QUEEN'S MOST EXCELLENT MAJESTY. THE HUMBLE ADDRESS OF THE SANITARY INSTITUTE.

May it please your Majesty,

We, the President, Vice-Presidents, and Council of The Sanitary Institute, on behalf of all the Members of that body, approaching your Majesty with every assurance of loyalty and affection to your Majesty's throne and person, humbly beg to offer our congratulations on the auspicious occasion of the completion of the Sixtieth year of your Majesty's reign over the British Empire.

Among the manifold benefits vouchsafed to your Majesty's subjects during this illustrious reign none has been greater or more peculiarly identified with the period than the widespread development of interest in Sanitary Science, and the correlative recognition of public duty with respect to improving the health and happiness of all classes of the people under your Majesty's beneficent sway.

We would humbly instance the successful efforts made to diffuse a general knowledge of the laws of health in the Home and in the Community; the vast store of valuable information acquired by patient Scientific observation; the study of preventive measures against the spread of disease, which have included not only the Scientific attack on Epidemic Disease but also the improvement in the planning, construction, drainage, and ventilation of dwellings, schools, factories, and other buildings, in which your Majesty's subjects pass so much of their lives.

These efforts have eventuated in many legislative enactments under your Majesty's gracious assent, relating to Public Health Measures, Municipal Corporations, Factories and Workshops, Buildings, Poor Law, the Housing of the Working Classes, the Prevention of the Pollution of the Water, and of the Adulteration of the Food Supplies; besides Legislation as to Ships and Canal Boats and numerous other measures which have kept step with advancing knowledge.

In the promotion of these measures The Sanitary Institute has rejoiced to take an active part, and has by its Training and its Examiis materially aided in providing efficient Officers to administer ws so wisely framed.

nest work in these and in many other directions in which your y and the Members of your Royal House have ever evinced the st interest, has tended to assist the Poorer Classes to lead purer re cleanly lives, and its fruit is seen in the reduction of mor- the lengthening of life, the improvement in physique, and in neral development of prosperity; in fine, in the appreciative and contentment of a free and virile people.

earnestly pray that your Majesty may be long spared to con- reign richly associated with the blessings of peace and pros- vouchsafed by Almighty God in so signal a measure to your y's Kingdom and Empire.

Signed on behalf of this Institute, this the Seventeenth day of June, in the year One Thousand Eight Hundred and Ninety-seven.

GEORGE,
President.

DOUGLAS GALTON, K.C.B.,
Chairman of Council and Vice-President.

ken whereof the common Seal of the Institute was hereunto

W. GUYER HUNTER, K.C.M.G., *Surgeon-General,*
Registrar and Vice-President.

A. WYNTER BLYTH,
Member of Council.

TE WALLIS,
Secretary.

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ollowing acknowledgment has been received:—

SECRETARY OF STATE, HOME DEPARTMENT,
WHITEHALL, S.W.
2nd July, 1897.

I have had the honour to lay before the Queen the loyal iful Address of The Sanitary Institute, congratulating Her on the occasion of the completion of the Sixtieth Year of ign, and I have to inform Your Royal Highness that Her was pleased to receive the same very graciously.

I have the honour to be, Sir,
Your Royal Highness's obedient Servant,
M. W. RIDLEY.

His Royal Highness
ke of Cambridge, K.G.,
&c., &c., &c.

TWENTY-FIRST ANNIVERSARY OF TH FOUNDATION OF THE SANITARY INSTIT

The Twenty-first Anniversary of this Institute occu July of this year, and the Council arranged a Commen Dinner on July 7th, to celebrate the success that has, the past twenty-one years, attended the efforts of the I to promote the Public Health and advance Sanitary Sci

It must be a matter of congratulation to the Memb Associates that this epoch in the history of the Institut in a year when the whole British Empire is engaged brating the long reign of its Queen, which, covering as a period of sixty years, is marked by more measures d to promote the health and happiness of the people th similar period in English history.

His Royal Highness The Duke of Cambridge, K.G., P of the Institute, was in the chair.

Among those present were: The Earl of Stamfor Kelvin, Sir Alexander R. Binnie, Sir Henry C. Burdett, Sir Douglas Galton, K.C.B., Chairman of Council, Sir R. Gowers, Sir Guyer Hunter, K.C.M.G., Sir Franci Powell, Bt., M.P., Sir Robert Pullar, Sir Robert Ra K.C.B., Major-General Williams, Dr. W. J. Colli L.C.C., Prof. W. H. Corfield, Dr. R. Farquharson, Dr. Garnett, Mr. Shirley Murphy, Mr. T. Salt, Mr Symons, F.R.S., Dr. B. A. Whitelegge, a large majorit Council, and a number of Members and Associates, alt about 130.

H.R.H. The DUKE OF CAMBRIDGE, in proposing the toast Majesty The Queen":

My Lords and Gentlemen,—On this occasion I am sure w forget the events which have occupied us all more or less for many days past, and I think we must all come to the co that this great gathering of nations, as I may say, has been vellous success. By good management and great care, ev has passed off in a manner which has produced no ill effec sort or kind. And I feel sure we all rejoice, and no one more than Her Majesty the Queen, at the success of this gre that has brought us all closer together.

I am satisfied that we all, more than ever, with cordia affection, shall receive the toast of the Health of H.M. The

Rt. Hon. LORD KELVIN, F.R.S., proposing "The Pri Princess of Wales, and Royal Family":

Your Royal Highness, my Lords and Gentlemen,—I honour to propose the toast of the "Prince and Princess and other members of the Royal Family." The Royal Fa a never failing attention to the welfare of the people in all orks designed to promote the improvement and happiness of the The Prince of Wales has done much to render the sixty years' ent reign of Her Majesty memorable for ever by laying a good tion of ways and means for those most beneficent of all :ions—the Hospitals of London. The Princess of Wales' kind t for the poorest of the poor, we all remember with deeply l gratitude. She endeavoured to make the Jubilee of Queen a happily remembered by the very poorest. His Royal ss, the Duke of Cambridge, President of the Sanitary Insti- head of the British Army, directed great reforms of sanitary ments, which have been of inestimable benefit, not only to ıy and the British Empire, but to all the people of the world. the 41 years he was Commander-in-Chief, the death-rate of itish soldier has fallen from something like 16 or 18 per ıd to about 4 or 5 per thousand. That great result came ıe experiences of the Crimean campaign. The saddest part campaign—glorious and creditable as it was to the British -was the great mortality due to the utter want of proper ' methods and appliances.

Royal Family have taken a great interest in The Parkes ı. It was for many years under the patronage of Her Majesty Victoria. The Duke of Edinburgh was President of the l and Sanitary Exhibition organized by the Parkes Museum . The Duke of Albany was President and opened its present s in the year 1883. The Duchess of Albany has taken much in The Sanitary Institute, has attended many of the lectures, es a practical interest in the work promoted by The Sanitary e.

Duke of Cambridge has been a member of The Sanitary e for about 15 years, and has displayed much interest in : the great works undertaken by The Institute.

nk that in any ordinary meeting it is quite enough to ı the names of Their Royal Highnesses the Prince and ı of Wales to ensure an enthusiastic acceptance of the toast, am quite sure that The Sanitary Institute especially will it with cordiality.

FRANCIS SHARP POWELL, M.P., Vice-President, proposing Navy, Army, and Auxiliary Forces":

it please your Royal Highness, my Lords, and Gentlemen,— the honour of proposing one of the few toasts which have t on the list. The toast given to my charge is the health of y, Army, and Auxiliary Forces.

s been the lot of your Royal Highness to serve the Army of ıntry with great distinction during many years, and during ıe you have won the gratitude of an appreciative and loyal and I am proud, Sir, to have the honour of proposing such a such a presence. There never was a time when the Army and ıvy held a higher position in the estimation of the English people than they do at the present time. We have had in the Review, and in the Review at Aldershot, a display of power unequalled in the history of the world, and we have the satisfaction and encouragement of knowing that these spe were the outward and visible manifestation of a great reality.

We know in one sense happily, and in another unhappily, these great spectacles mean. We know the men and what th made of, and are proud to think that in whatever circumstance are placed they prove themselves equal to the occasion. Whetl look to what took place at Chitral, or to what has taken place pestilential marshes of West Africa, or in the hills and vall South Africa, every man has been equal to the occasion.

But we as a Sanitary Institute ought to bear in mind that n contributes so much to naval and military success as the plac the field of battle or on the deck, men who are physically eq every emergency.

There are gentlemen here present, and Your Royal Highn the most distinguished, who remember the days of the Crimea, believe they can bear testimony to the progress that has been since these days in the Sanitary administration of the Arm sometimes think that in our admiration of military achievemen do not bear in mind all the difficulties that have to be cont with. We have in the army many difficulties to contend difficulties from climate, from exposure and other causes, and di ties from young men whose prudence and self-restraint are not to their courage, and I am perfectly sure in proposing the hea the Navy and Army, we should do them injustice if we did moment forget these difficulties.

I have the honour, Sir, and am proud of the honour, of co with this toast your illustrious name. Your name will lo recorded, and ever remembered in the history of this country it is a circumstance which we should bear in mind with gra that the army gained and did not lose in efficiency and power d your long career as Commander-in-Chief. I will only say t your services were valuable, our most respectful gratitude proportion great. I give the toast of the Navy, Army, and Au Forces, coupled with the name of the Duke of Cambridge.

HIS ROYAL HIGHNESS THE DUKE OF CAMBRIDGE: I feel very gratified and pleased that my name should be coupled with the which the honourable gentleman has so kindly proposed. Fro

at large will bear it in mind. We ought to remember that
ited force gives us great strength and power, and that whilst
n army is comparatively small there is an enormous amount of
vailable in our Colonies and India. And when you add to
at the nation is loyal to the backbone, we feel that this great
is something to be proud of. I say when we consider this
in the people themselves, the great power in the navy, and
h efficiency of the army, we ought to feel grateful for what
ess, and have a right, without boasting, to feel proud of our-
nd the country to which we belong. I am pleased to hear
rences that have been made to the improvement in the health
rmy. During the 60 years of Her Majesty's reign nothing
e greater progress than Sanitary Science, and I am very glad
my support to and to preside over The Sanitary Institute,
as played such an important part in bringing about that
.

hile I recognise to the full the value of the scientific research
s contributed to this result, I would warn you against the
n" and sentiment of the present day which tend to limit the
on of measures shewn to be of material benefit in checking
ad of disease. I allude particularly to vaccination and to
agious diseases acts. Those who know the enormous amount
ss and disability in the army caused by venereal disease feel
that sentiment with regard to interfering with the liberty
ain class of the people should not be allowed to stand in the
he application of measures of prevention which are adopted
countries. With the immense progress we have made in
ge and science, we ought to keep the lead in everything, and
e have good sense—good common sense, we ought to lead
d. The English nation which I am proud to belong to, and
have no doubt you are all proud to belong to, if she only
her guns, will I am sure in the long run, beat everybody else.

. J. COLLINS, in proposing "The Houses of Parliament":

Royal Highness, my Lords, and Gentlemen,—I have the
o submit to you the toast of the Houses of Parliament, and
y how much I feel the honour of being entrusted with this
am pleased to be present at this gathering of The Sanitary
as a student of public health questions, a Fellow of your
, and as Chairman of the largest local health authority in
dom. The London County Council comes in contact with
matters in various relations—in the main drainage scheme,
he provision of artisans' dwellings and model lodging houses,
nce of insanitary areas, the disposal of refuse, the construc-
sylums, &c., and in these respects has done much to improve
nic condition of life in London. But my duty to-night is
ng the praises of the London County Council, whose virtues
are numerous—perhaps more numerous than is sometimes
ted. It is a matter of great interest to us of the London
Council who administer laws to come in contact with those

upon whom falls the duty of making the laws we have to administe and also with those who are studying the problems of life in communities, and enunciating the principles on which laws for the welfare of the people must be based. I may say that the Sanitary wo of the London County Council is often facilitated by the informatio and suggestions received from such bodies as The Sanitary Institut

I am pleased to see here to-night representatives from bo Houses of Parliament, and with regard to the Upper House, I ha the honour of associating with this toast the name of the Rt. Ho the Earl of Stamford; and in regard to the House of Commons, have the honour of coupling with the toast the name of D Farquharson.

The **Earl of Stamford**, replying for the House of Lords:

I have some slight practical acquaintance with sanitary matter as it was my privilege some years ago to do a little work in the Ea end of London, in connection with the Mansion House Committ on the Dwellings of the Poor (sometimes familiarly known as th Smell and Tell Committee), and I may say that in those years I d a great deal of "smelling" and a certain amount of "telling," whic I hope was not unproductive of good results.

What occurs to me with regard to the House of Lords is this, th we have a very favourable opportunity in it for discussing careful points of real social interest to the community. In the House Commons there is comparatively little time to discuss these matte There is a great crowd of business, which has to be forced throug and it is impossible to devote the necessary time to each questio But in the House of Lords there is full opportunity for discussi them thoroughly, and they are voted upon I trust conscientiously.

And what I think ought to rank in a prominent position in the discussions is matters of sanitary interest. A short time ago the was an extremely valuable and interesting discussion upon the sanitary condition of the Indian army—a discussion to which H.R.H The Duke of Cambridge contributed a very valuable and interestin speech, and I regard it as a great privilege to have been present o that occasion. Well, I hope the House of Lords may contribut and aspire, to make itself useful in matters that really concern th community at large.

It is a curious circumstance that to-day I have had an intimatio that I am requested to move the second reading in the House o Lords of a Bill that has passed the House of Commons th afternoon, which is certainly of some sanitary interest, but I almo blush to mention the title, and to think of standing up to move th second reading of the "Verminous Persons'" Bill. But I shall do m best to carry that measure through, and if we can help those "person to purify themselves, then I am sure we shall be doing a publ service, and I hope I shall have the support of The Sanitary Institu in taking this small step towards a sanitary reform.

Dr. **Farquharson**, replying for the House of Commons: I a proud to have enjoyed the hospitality of The Sanitary Institu n glad to be associated with such a distinguished member of the House. I think it a great privilege for them to come er and talk a little about politics in a friendly way, and of there could be no party politics in questions of sanitation.

iink the House of Commons has done a great deal of good luring the last six years, and may claim in addition that they ielped to raise the value of human life and make it more rous and happy.

sh to say that the health of the British Constitution so far is in our keeping is in a thoroughly sound and satisfactory on. Still I am sorry to state that many of the members have to a very flabby and idle disposition, and I am afraid the is a much more attractive and agreeable place than the and that the study of Bradshaw and A.B.C. has to a large taken the place of more important studies.

HENRY BURDETT, K.C.B., in proposing "The Sanitary In-:

ard it as a great honour to have been selected by the Council ose the toast of "The Sanitary Institute" this evening. This as been confided to me because I am one of a very few of the promoters now living who banded themselves together to found stitute twenty-one years ago. Sir Douglas Galton, the Chair- the Council, will speak of what has been done during those -one years, and I propose to confine my remarks mainly to a ration of the then state of affairs in sanitary matters, and to a few of the men to whom the improved condition of public natters in these realms is largely due. Twenty-one years ago, as sanitation was concerned the public were ignorant and ent. The bulk of the members of the medical profession were d as to the value of sanitation, and disinclined to recognise it ce, by the utilisation of which they could materially improve lic health. The Press of this country were for the most part ng to give space to what they regarded as a dry subject, of terest or importance. It is but just, however, that I should tribute of grateful recognition to the editors of the great olitan papers, and especially to the editors of *The Times* and *andard*, who from the earliest days willingly gave space to irs of the Institute, and supported in their leading columns ands for reform and improvement, with the view to a diminu- disease, and of the evils arising from imperfect cleanliness isregard to the principles of sanitation. The attitude of the was largely justified from the circumstance that very few were interested, and of the few some were easily choked off dulness of the matters which had to be studied and mastered they could take any useful part in the work. Twenty-one go there was no Public Health Act for London, and what ant no one realised better than myself, who, as Special Com- er for more than one scientific journal, found it nearly impos- bring about the destruction of numerous fever nests, or small infected areas of disease, the presence of which materially increase the death-rate in those days. In matters of drainage there wa much to be done. Very few houses were properly drained; most o the Government Offices, and even the Queen's Palaces, were ver insanitary. There was an absence of provision for the isolation o infectious diseases and the adequate treatment of infected patient And here I would remind you of the great change in public opinio which was indicated by the passing and enforcement of the Notification of Infectious Diseases Act in the year 1889. That Act brough about a revolution in this country, for it entailed an interferenc with the privacy of the home, rightly regarded as the Englishman' castle; and yet, so conscious were the people of its necessity an desirability, that its provisions are now enforced throughout the lan without question, and even without complaint. The water suppl nearly everywhere was indifferent or defective, and the systems o drainage in many places were bad. The majority of the hospitals an asylums had no plans of their drains, and where plans existed the were far from accurate, and in no way to be relied upon. Th mortality in the best hospitals after serious surgical operations wa at the time I am speaking of 37·8 per cent., and it is interesting t note in this connection Lord Lister's work on the Germ Theory o Fermentative Changes was published in 1875. Thanks, however, t Lord Lister's teachings and crusade, to the improved state of sanitation, and to the fact that the agitation which commenced in Th Sanitary Institute had such an effect upon public opinion that nearl every large hospital was re-drained, and that hundreds of thousand of pounds were spent upon drainage works in connection with ou large public institutions. The mortality in regard to the mor serious surgical operations in hospitals has fallen from 37·8 to something like 2 per cent., whilst the number of these operations ha increased a hundredfold. There was little literature on the subject and that which existed was mostly buried in blue-books not readil accessible. I consider that The Sanitary Institute has rendere important public service by republishing the writings of men lik Farr and Simon, and of other fathers of the science. Finally, ther existed no test of competence, and no means of training persons a sanitary officials. Local Surveyors, Inspectors of Nuisances, and even Medical Officers of Health were all in the same boat, for all were without special training or qualification, and did not even possess accurate knowledge or information. Inadequately paid, without needful appliances, authority, or special education to do their work properly, the principles which it was their duty to enforce were necessarily neglected or scouted, and the health condition of Great Britain was in a state to make those of us who have passed through the intervening twenty-one years, and who realise the facts, marvel at the progress which has taken place.

Great as has been the progress, and high as is the average efficiency in matters sanitary almost everywhere, it would be wrong to omit to mention two matters which press for the earnest attention of Londoners, and of the Royal Institute of British Architects, and of the ution of Civil Engineers respectively. London, unfortunately, gard to certain health matters is still under the control of the ies. London is, therefore, a disgraceful city in some respects y. In the district of Paddington, for example, in this year of Diamond Jubilee, wherein the greatness and majesty of the h Empire has been so convincingly exhibited, the streets of one e wealthiest portions of London, *i.e.*, Paddington, are left pt and uncared for from Saturday to Monday in each week. atter how high the temperature, or how filthy the streets may e streets of probably the wealthiest district in the Metropolis e Empire are made dangerous to health by the supine in-nce and criminal neglect of the Paddington Vestry. The late Randolph Churchill and some of the most influential of the nts have entreated and protested in vain, and it is stated, with truth I cannot say, that the dangers to health incurred so sly by the Paddington Vestry, despite the ever increasing are due in a measure to the fact that the Vicar of Paddington rict Sabbatarian and also the Chairman of the Vestry. It is d to be due largely to his influence that the intelligent ner, to his surprise and disgust, may see in the streets of gton on any Sunday, when the principal residents are at home , fermenting filth and even dead cats, dirty papers, and various of offal, which offend the senses and infect the atmosphere, to nger of the inhabitants. Such a state of affairs is as shameful unaccountable.

other matter which cannot be passed over without comment is ndal which arises from the intimation which recently appeared newspapers that a new asylum, costing many thousands of s, within two years of its being occupied was found to be so ary that the inmates were attacked by fever and illness, and the ainage system had to be reconstructed. I make bold to declare ch a state of affairs as this, and it is unfortunately not wholly ional, demands immediate attention on the part of the ruling ities of the Institute of British Architects. Where the drainage, se like that referred to, has been carried out by the architect then the matter lies wholly with the Royal Institute of British ects; if by an engineer, then with the Institution of Civil En-. If the law provides that a special enquiry shall be instituted Government into every railway accident, it ought surely to e that a special inquiry should be held in cases where the pro-al advisers erect buildings and lay down drains which produce ics within two years of their construction. I make bold to say y professional man who is responsible for such buildings and ge works should be struck off the roll of his profession, or at te that his name should be put on a list with the findings of mmittee of Enquiry, so that any one who employs him for the may clearly understand the risks which they are likely to run rd to the sanitary conditions of any buildings which they to be erected.

ourse the early founders of The Sanitary Institute hoped to

secure the enforcement of the laws of health, and aspired to di
the death-rate, and to everywhere promote the happiness of the
by improving their physical and moral condition. There wer
trials and difficulties at the commencement, as I have already inc
and our equipment for the work consisted mainly of much con
energy but little cash. We were encouraged by the example an
sel of men like Sir Edwin Chadwick, Sir Benjamin Richards
Robert Rawlinson, Professor de Chaumont, and Dr. Steele, w
untiring in their devotion to the work in hand. We owed muc
Duke of Northumberland, who, from the earliest days, has been
friend of the Sanitary Institute, and who, by his influence and s
has materially aided its development. I cannot in justice refrai
mentioning the fact that to the business ability, energy, and p
knowledge of Mr. G. J. Symons, F.R.S., the Registrar, the In
owes a debt of gratitude which it would be difficult to exag
Our methods consisted in speaking, writing, discussion, a
exhibition of indomitable energy, despite every discourag
entailing an amount of work highly creditable to all who h
hand in the doing of it. Of cash, as I said before, there was
but we believed in the principles we had set ourselves to teac
so, though none of us were rich men, all of us were willing
freely in the cause in which we believed, for our hearts were
work. As I have said already, Sir Douglas Galton will she
far we have succeeded in our aspirations. These led us to spe
be spent in an endeavour to make the homes of the peopl
hospitals, our cities and villages wholesome and healthy for po
and rich alike. We had a municipal ideal in our mind, for
we have continued to work, and to work successfully throu
intervening years. This ideal included the conviction that
poor person inherits a natural right to be provided at a cost
his means, with good water, good air, and a healthy dwelling
in. I do not think that any of us have quite realised, what is
the truth, that of all the agencies in the hands of a stat
whereby the moral life of a nation can be raised and benefited
is none so potent for good as sanitary science. The moral v
sanitary science is a great factor for the good of the people.
men and ministers of religion, and the most devoted of
missionaries may find themselves powerless to remedy the e
a given area occupied by a crowded population, the police m
prove powerless to introduce the necessary reforms; but wi
advent of the Sanitary Officer success invariably follows,
brings cleanliness, fresh air, sweetness, and light. It is the S
Officer who has the power to remove the evils by closing th
nests and pestilential houses, and he it is through the force of
opinion, which, thank God, is now behind him, who is able to
through Parliament, that where hundreds of thousands of th
are displaced from such houses, there adequate dwellings sh
erected in their place, which shall be hygienically suitable f
maintenance of the physical and moral health of the people.

I have thought it well to remind this audience, and all wh r, of the moral value of sanitation and public medicine, for, as one he early Commissioners who has had to condemm areas, and stigate epidemics in many places, under very varying conditions, a conscious that of all the good which has come from the teachings nitary science and the work of this Institute there is none to pare with the great moral effects which have followed the freeing e people from unhealthy surroundings and contaminating filth of inds. He would be a bold man who to-day described sanitary ice as a dry and uninteresting subject, for to-day a sceptical n has come to realise and admit that Lord Beaconsfield was ; when he said that the true policy and the best for an English sman was embodied in the maxim "Sanitas sanitatum, omnia as."

am very pleased to couple with this toast the name of Sir glas Galton, to whom the Institute owes so much for his interest energy in directing the Institute, as Chairman of Council for r years of The Parkes Museum, and during three different ds Chairman of Council of the Institute. I have also to couple it the name of Prof. W. H. Corfield, the latest elected Vice-dent.

r **Douglas Galton** said: I feel a great responsibility in nding to the toast of The Sanitary Institute which Sir Henry ett has so ably proposed. He has told you of the early hopes aspirations of The Sanitary Institute. The Institute has met y to celebrate its majority. We can certainly congratulate it e success which has attended its efforts during the past twenty-ears. The hopes and aspirations of 1876 have been more than ed.

e Public Health Act of 1875 gave a new development to sanita- all over the country. We founded The Sanitary Institute in for the purpose of advancing knowledge in all subjects bearing ublic health. That object has been the mainspring of our s during our career. In 1877 we commenced examinations for ary Inspectors. These examinations soon revealed to us that ng educational institutions afforded to the candidates no means aining knowledge in the principles of sanitary science.

t the Parkes Museum had been instituted in the same year as anitary Institute, viz., 1876, as a permanent memorial of Dr. nd Parkes, the first Professor of Hygiene at Netley. It had incorporated in 1882 under the patronage of the Queen and residency of His Royal Highness the Duke of Albany. This um afforded a means of giving instruction on Sanitation by res and Demonstrations on a practical basis; and the efficient a of The Sanitary Institute and of the Parkes Museum was y increased by the union of the two Institutions which took a few years later.

may say without hesitation that the methods of instruction a have been developed by means of lectures, demonstrations, ical teaching in the Parkes Museum, and the use of its valuable

Library—which is open to our students—afford a more complete hygienic education for that class of students than can be obtained elsewhere in this country.

We have further endeavoured to advance sanitary knowledge in the provinces by our annual or biennial Conferences and Exhibitions, at which we organize conferences of medical officers of health and sanitary inspectors from the surrounding districts.

We have endeavoured to secure that our Exhibitions shall be a means of education by introducing and maintaining throughout the sixteen years in which we have held them a uniform system for judging the exhibits, and our awards thus afford a real standard of merit.

I am happy to say that our exertions have been rewarded with a large measure of success. Our earliest Congress, in 1877, began with 150 members, and an income of £240. The roll of membership has gathered strength as the years have passed, so that the hundred-and-fifty of 1877 have multiplied into two thousand one hundred members in 1897. The income of the Society has increased from £240 in 1877 to £6,000 in the present year.

The number of candidates examined in 1877 was five, three of whom obtained certificates. The number of candidates examined in 1896 was 521, of whom 300 obtained certificates. This success has not, however, been attained without much struggle and many sacrifices.

But we gratefully recollect that the Parkes Museum in its earlier days was favoured by the Patronage of the Queen, by H.R.H. the Duke of Albany, who accepted the office of its first President, and after His Royal Highness' lamented death by H.R.H. the Duchess of Albany, who became an active Patroness of that Institution.

The Sanitary Institute has been favoured by the uniform support afforded it by our first President, His Grace the Duke of Northumberland, afterwards by the Duke of Westminster, and now by your Royal Highness.

We have received much encouragement and support from some of the Members of Council, one of whom who is, I regret to say, absent from illness to-night, viz., Mr. Rogers Field, who has assisted us in our time of difficulty by munificent donations to aid the development of our Museum. But I have I fear trespassed too much upon your patience by dwelling on these historical statistics. I have, however, only desired to bring to your notice the motto which has invariably guided us, namely, that Achievement is only a stepping stone to further progress.

There is no science which has developed so largely in the Victorian era as Sanitary Science. Recent progress has mainly depended upon hypothesis, and I saw somewhere the other day a suggestion that, as the great patron of progress is hypothesis, it would be appropriate to canonize this patron and create a new saint, viz., "Saint Hypothesis." Hypothesis is certainly a saint who is very persistently worshipped in the medical world. But our Sanitary Science rests on principles which were promulgated in the days of ses and Hippocrates; and although we are now, by the help of it Hypothesis and the Bacteria, obtaining a fuller explanation of sons, the one watchword—"Purity in Air, Soil, and Water,"—holds good. It is the watchword which has enabled your Royal hness in your forty years' control of the British Army to reduce death-rate in time of peace from 14 and 18 per 1000 to between d 5 per 1000; and it is by attention to this watchword that the ı of Queen Victoria has formed so memorable an epoch in tary Science.

ROFESSOR CORFIELD, also responding for The Sanitary Institute, I wish to thank Sir Henry Burdett for the very kind way in h he has coupled my name with the toast, and I wish also to hat all members of the Institute would congratulate him on the rved honour which had been conferred upon him. I also take opportunity of thanking the Council of the Institute for the t honour they have done me in electing me a Vice-President of institute.

have been asked to report to you the messages received from our . Fellows abroad who are unable to be with us this evening; the is a telegram received this morning from Vienna—

> "Three hearty cheers for your noble Queen, for the Duke of Cambridge, and for The Sanitary Institute, from your Austrian Honorary Fellow, Franz von Gruber."

. Modesto Martinez y Gutherez, President of the Spanish ty of Hygiene, writes a long letter, in which he says—

> "You are the successors of the immortal Jenner, and the whole world is indebted to you for the great progress made in preventive medicine."

tters of regret have also been received from Professor Petten- , Dr. Prosper de Pietra Santa, referring with pleasure to his iation with the Institute in the early years of its formation, ors Paul Brouardel, A. Zoeros Pasha, J. S. Billings, Van Over- de Meyer, and Henry P. Walcott, and from the Secretary to Koch of Berlin, who is at present in India.

hat has struck me most in reading these replies is the manner hich the leadership of England by The Sanitary Institute in ary Science is acknowledged by all the correspondents.

FORTHCOMING MEETINGS.

CALENDAR, JULY TO NOVEMBER, 1897.

As far as at present arranged.

Council Meetings are held Monthly on the Second Wednesday in each Month at 5 p.m., except August and September.

Special Purposes Committee	As occasion requires.
Finance Committee	Second Wednesday at 4.30 p.m.
Exhibition Committee	First Tuesday at 5 p.m.
Congress and Editing Committee	Second Monday at 5.15 p.m.
Education Committee	Third Monday at 5 p.m.
Museum and Library Committee	Fourth Monday at 5 p.m.
Parliamentary Committee	As occasion requires.

JULY.

23 F., 24 S. Examinations in Practical Sanitary Science and for Inspectors of Nuisances, Cardiff.

30 F., 31 S. Examinations in Practical Sanitary Science and for Inspectors of Nuisances, Norwich.

SEPTEMBER.

14 Tu., 15 W., 16 Th., 17 F., 18 S. **Congress and Exhibition at Leeds.**

Exhibition remaining open until October 9th.

27 M. Introductory Lecture to Sanitary Officers at 8 p.m, by Louis C. Parkes, M.D., D.P.H.

30 Th. Lecture to Sanitary Officers at 8 p.m. Sanitary Law: English, Scotch, and Irish; General Enactments; Public Health Act, 1875; Model Bye-Laws, &c.. by Herbert Manley, M.A. (Cantab), M.B., D.P.H.

OCTOBER.

4 M. Lecture to Sanitary Officers at 8 p.m. The Law relating to the Supervision of Food Supply, by A. Wynter Blyth, Barrister-at-Law.

7 Th. Lecture to Sanitary Officers at 8 p.m. Sanitary Laws and Regulations governing the Metropolis, by A. Wynter Blyth, Barrister-at-Law.

11 M. Lecture to Sanitary Officers at 8 p.m. Nature of Nuisances, including Nuisances the abatement of which is difficult, by

14 Th. Lecture to Sanitary Officers at 8 p.m. Objects and Methods of Inspection, by J. F. J. Sykes, D.SC., M.D.

18 M. Lecture to Sanitary Officers at 8 p.m. Factories, Workshops, and Offensive Trades, by Prof. A. Bostock Hill, M.D., D.P.H.

21 Th. Lecture to Sanitary Officers at 8 p.m. Water Supply, Drinking Water, Pollution of Water, by Prof. W. H. Corfield, M.A., M.D. (Oxon.), F.R.C.P

I. Lecture to Sanitary Officers at 8 p.m. Infectious Diseases and Methods of Disinfection, by H. R. Kenwood, M.B., D.P.H., F.C.S.

h. Lecture to Sanitary Officers at 8 p.m. Diseases of Animals in relation to Meat Supply; characteristics of Vegetables, Fish, &c., unfit for food, by Alfred Hill, M.D., F.R.S.E.

NOVEMBER.

. Lecture to Sanitary Officers at 8 p.m. Principles of Calculating Areas, Cubic Spaces, &c.; Interpretations of Plans and Sections to Scale, by J. Osborne Smith, F.R.I.B.A.

1. Lecture to Sanitary Officers at 8 p.m. Ventilation, Warming, and Lighting, by Joseph Priestley, B.A., M.D., D.P.H.

. Lecture to Sanitary Officers at 8 p.m. Sanitary Building Construction, by Prof. T. Roger Smith, F.R.I.B.A.

1. Lecture to Sanitary Officers at 8 p.m. Details of Plumbers' Work, by J. Wright Clarke.

} Examinations in Practical Sanitary Science and for Inspectors of Nuisances, Newcastle-on-Tyne.

Lecture to Sanitary Officers at 8 p.m. Sanitary Appliances, by George Reid, M.D., D.P.H.

1. Lecture to Sanitary Officers at 8 p.m. House Drainage, by W. C. Tyndale, M.INST.C.E.

Lecture to Sanitary Officers at 8 p.m. Scavenging: Disposal of House Refuse, by Charles Mason, ASSOC.M.INST.C.E., A.R.I.B.A.

1. Lecture to Sanitary Officers at 8 p.m. Sewerage and Sewage Disposal, by Prof. Henry Robinson, M.INST.C.E.

ections and Demonstrations will be arranged on Wednesdays and ays during the Course. A List of these can be obtained of the Secre- t the commencement of the Course.

ONGRESS AND EXHIBITION OF THE INSTITUTE, 1897.

e Congress and Exhibition will be be held this year at Leeds vitation of the Lord Mayor and Corporation. The Council are to announce that over 300 Authorities throughout the kingdom appointed delegates to attend the Congress.

e Rt. Hon. the Lord Mayor, Sir James Kitson, Bart., M.P., has nted to act as Chairman, and Mr. Councillor Womersley as -Chairman of the Local Committee; and Dr. J. Spottiswoode son, Medical Officer of Health for the City of Leeds, Mr. A. E. on, M.R.C.S., and Mr. W. Spinks, Assoc.M.Inst.C.E., have appointed as Hon. Local Secretaries.

e Congress is to open on Tuesday, Sept. 14th, and extend to llowing Saturday.

programme of the arrangements as far as they have been decided ent will be found on the following pages.

THE
SIXTEENTH CONGRESS, 1897,

WILL BE HELD AT

LEEDS,

From SEPTEMBER 14th to SEPTEMBER 18th.

GENERAL ARRANGEMENTS.

ADDRESSES AND LECTURES.

President's Inaugural Address.
Lecture to the Congress.
Popular Lecture.

SECTIONS.

Section I.—Sanitary Science and Preventive Medicine.
Section II.—Engineering and Architecture.
Section III.—Chemistry, Meteorology and Geology.

CONFERENCES.

On River Pollution.
Of Municipal Representatives.
Of Medical Officers of Health.
Of Municipal and County Engineers.
Of Sanitary Inspectors.
Of Ladies on Domestic Hygiene.

EXHIBITION.

An Exhibition of Apparatus and Appliances relating to Health and Domestic use will be held in connection with the Congress.

PAPERS AND DISCUSSIONS.

The Council invite Papers on subjects relating to Health and Sanitary Science. Papers are limited to twenty minutes in reading. A short abstract must accompany every Paper, both for the convenience of the Press at the Congress and for insertion, subject to the approval of the Council, in the Journal of the Institute, should it not be deemed desirable to publish the Paper *in extenso*. No previously published Paper can be read. The acceptance of Papers, and the days on which they are to be read, are determined by the Council before the beginning of the Meeting. The Council reserve the right of refusing any Papers sent in; and in the case of those ited, the reading of them must depend on the time at the sal of the Meeting. Papers read at the Congress cannot be shed by the Authors, except by permission of the Council. ouncil reserve to themselves the privilege of printing any Paper it the Congress, either wholly or in part, or of refraining from ublication thereof, if they see fit.

Addresses and Papers or Abstracts thereof are usually printed Institute in London before the meeting of the Congress, and e purchased from the Secretary of the Institute during the ess. Authors should forward their manuscript by book post *ly as possible before August 21st*, addressed to the Secretary, ry Institute, Margaret Street, London, W.

EPTION ROOM AND PLACES OF MEETING.

Reception Room will be opened at THE TOWN HALL, on AY, SEPTEMBER 13TH, at 12 NOON, and on the following days A.M. for the issue of all Tickets in connection with the ess. The large Victoria Hall will be available for Writing and nade.

Inaugural Address of the President will be given in THE RY, YORKSHIRE COLLEGE. The Lecture to the Congress will en in THE ALBERT HALL, Cookridge Street.

Sectional Meetings, General Meetings, and Conferences will l in THE TOWN HALL, and other rooms adjoining.

Popular Lecture will be given in THE ALBERT HALL.

EL AND LODGING ACCOMMODATION, AND TRAVELLING ARRANGEMENTS

determined by the Local Committee, and information relating same may be obtained from the Honorary Local Secretaries, Hall, Leeds, and from the Secretary of the Institute.

TICKETS.

ws, Members, and Associates of the Institute, are supplied ickets for the Congress on application to the Secretary before gress, or may be obtained at his Office in THE TOWN HALL the Meeting.

hose not connected with the Institute, Congress Tickets will d, entitling the holder to the use of the Reception Room, to on to the Presidential and other Addresses, to all Meetings, Exhibition of the Institute, and to any Conversazione given Institute. The price of the Congress Tickets is Half-a-guinea These Tickets may be obtained at the Office of the Hon. ecretaries at THE TOWN HALL, or at the Offices of THE INSTI- 2, Margaret Street, London, W.

EXCURSIONS.

ulars of these will be published in a later Programme, and and List of Places to be visited can be obtained at either the ry's Office, or the Office of the Hon. Local Secretaries during eting.

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Local General Committee.

THE RIGHT HONORABLE THE LORD MAYOR OF LEEDS
(Sir JAMES KITSON, Bart., M.P.), *Chairman.*
Councillor B. WOMERSLEY, *Vice-Chairman.*

The Lord Lieutenant, the Deputy Lord Lieutenants, and Judges and Justices of the County of York; the Lord Mayor, Aldermen, and Councillors of the City of Leeds, with the Town Clerk, City Engineer, Medical Officer of Health, City Accountant, and Chief Sanitary Inspector; the Bishop of Ripon and Leeds Clergy of all Denominations; the Members of Parliament of the Cities of Leeds, Sheffield, Wakefield, and York, and the Boroughs and County Divisions of the West Riding of Yorkshire; the President, Council, Professors, Lecturers, and Secretary of the Yorkshire College; and representatives of the Urban and Rural District Councils; and the President, Chairmen or other representatives of various bodies, Scientific and Literary Societies in Leeds.

Hon. Local Secretaries.

J. SPOTTISWOODE CAMERON, M.D., B.SC., Medical Officer of Health, Leeds.
A. E. PEARSON, M.R.C.S., L.R.C.P. | W. SPINKS, ASSOC.M.INST.C.E.

County Councils, Corporations, and Local Authorities, who have up to the present appointed Delegates to the Congress.

GOVERNMENT DEPARTMENT—
War Office.

THE COUNTY COUNCILS OF:

Aberdeen.
Bedfordshire.
Cardiganshire.
Carmarthenshire.
Cheshire.
Clackmannanshire.
Cornwall.
Cumberland.
Devonshire.
Durham.
East Riding of Yorksh're
East Sussex.
Essex.
Fife.
Forfar.
Gloucestershire.
Haddington.
Kesteven.
Lancashire.
Lanark.
Lindsey, Lincolnshire.
Middlesex.
Midlothian.
Nth. Riding of Yorksh're
Northumberland.
Perth.
Surrey.
Stewartry and Kirkcudbright.
Warwickshire.
West Suffolk.
Worcestershire.
Wigtownshire.

THE COUNTY BOROUGHS OF:

Barrow-in-Furness.
Bath.
Birkenhead.
Birmingham.
Bootle.
Bradford.
Brighton.
Bristol.
Burnley.
Cardiff.
Coventry.
Croydon.
Derby.
Exeter.
Glasgow.
Halifax.
Hanley.
Kingston-on-Hull.
Leeds.
Lincoln.
Liverpool.
Newcastle-upon-Tyne.
Newport.
Norwich.
Portsmouth.
Preston.
Rochdale.
St. Helens.
West Ham.
West Bromwich.
Wigan.
Wolverhampton.

THE URBAN DISTRICT COUNCILS OR SANITARY AUTHORITIES OF:

Abram.
Ardsley, East and West.
Bacup.
Baildon.
Barking Town.
Benfieldside.
Bicester.
Bingley.
Birkenshaw.
Blackpool.
Bournemouth.
Brighouse.
Burley-in-Wharfedale.
Burslem.
Carlisle.
Carnarvon.
Chelmsford.
Chepping Wycombe.
Cleckheaton.
Cowbridge.
Crewe.
Darfield.
Doncaster.
Drogheda.
Dumbarton.
Eastbourne.
Ebbw Vale.
Eccles.
Elland.
Enniskillen.
Eston.
Failsworth.
Felling.
Festiniog.
Folkestone.
Forres.
Gomersal.
Great Harwood.
Harrogate.
Haworth.
Haydock.
Hebden Bridge.
Helensburgh.
Hendon.
Heywood.
Hindley.
Honley.
Horbury.
Hoylake & West Kirby.
Ilford.
Ilkley.
Innerleithen.
Jarrow.
Kearsley.
Kidderminster.
Kinghorn.
Knottingley.
Lancaster.
Lambeth Vestry.
Leigh.
Leith.
Linlithgow.
Littleborough.
Liversedge.
Lockerbie.
Macclesfield.
Maidstone.
Malvern.
Malton.
Middlewich.
Midsomer Norton.
Mountain Ash.
Mytholmroyd.
Nelson.
Newburn.
Norham & Islandshires.
North Bierley.
Ossett.
Old Swindon.
Oswestry.
Paddington Vestry.
Pembroke, Co. Dublin.
Pollokshaws.
Pontefract.

URBAN DISTRICT COUNCILS—*Continued.*

Radcliffe.
Pudsey.
Radcliffe.
Rawtenstall.
Ripon.
St. George-the-Martyr, Southwark.
St. John, Hampstead Vestry.
St. Mary, Newington Vestry.
St. Marylebone Vestry.
St. Mary, Stoke Newington, Vestry.
St. Olave's Dist. Board of Works, Southwark.
St. Pancras Vestry.
Sale.
Scarborough.
Scunthorpe.
Seaford.
Selby.
Shelf.
Slaithwaite.
South Crosland.
Southport.
Sowerby Bridge.
Stockton-on-Tees.
Strand Board of Works.
Swinton.
Thornhill.
Thornton.
Tonbridge.
Torquay.
Tuam.
Tyldesley with Shakerley.
Tynemouth.
Wallasey.
Walton-le-Dale.
Warley.
Warrington.
West Hartlepool.
Weymouth.
Widnes.
Winsford.
Yeovil.
Ystradyfodwg.

THE RURAL DISTRICT COUNCILS OF:

Ampthill.
Bath.
Bodmin.
Carlisle.
Culmstock.
Dover.
Enniscorthy.
Evesham.
Glanford Brigg.
Gloucester.
Halesowen.
Hemsworth.
Holywell.
Horncastle.
Hunslet.
Kingswinsford.
Knaresbrough.
Leeds.
Llandaff & Dynasdowis.
Newark.
Ormskirk.
Saddleworth.
St. Asaph.
Scarborough.
Tadcaster.
Wakefield.
Warrington.

PORT SANITARY AUTHORITIES AND OTHERS.

Chester Port Sanitary Authority.
Hull and Goole Port Sanitary Authority.
Liverpool Port Sanitary and Hospital Committee.
Port of London Sanitary Authority.
Clayton-le-Moors and Gt. Harwood Joint Sewerage Board.
Haslingden, Rawtenstall, and Bacup Outfall Sewerage Board.
Metropolitan Asylums Board.
Richmond Main Sewerage Board.
West Riding of Yorkshire Rivers Board.

SCHOOL BOARDS.

Blackburn School Board.
Bradford School Board.
Brighton and Preston School Board.
Derby School Board.
Halifax School Board.
Leeds School Board.
London School Board.
Norwich School Board.
Rochdale School Board.
Salford School Board.
Wigan School Board.

Societies who have appointed Delegates to the Congress.

Architectural Association.
Birmingham and Midland Institute.
Bradford Scientific Association.
British Association of Waterworks Engineers.
British Institute of Preventive Medicine.
British Medical Association.
Civil and Mechanical Engineers' Society.

Cremation Society of England.
Edinburgh Architectural Association.
Faculty of Physicians and Surgeons, Glasgow.
Federated Institution of Mining Engineers.
Geologists' Association.
Geological Society.
Glasgow Institute of Architects.
Huddersfield Medical Society.
Incorporated Gas Institute.
Institute of Chemistry of Great Britain and Ireland.
Institution of Junior Engineers.
Institution of Mechanical Engineers.
King's College, London.
Leeds Geological Association.
Leeds Philosophical and Literary Society.
Leeds and West Riding Medico-Chirurgical Society.
Liverpool Engineering Society.
Manchester Society of Architects.
Mason College, Birmingham.
Medical Society of London.
Metropolitan Public Gardens Association.
National Health Society.
North-East Coast Institute of Engineers and Shipbuilders.
Northern Architectural Association.
North-Western and Midland Sanitary Inspectors' Association.
Nottingham and District Sanitary Inspectors' Association.
Queen's College, Belfast.
Royal British Nurses' Association.
Royal College of Physicians of London.
Royal College of Physicians, Edinburgh.
Royal College of Physicians of Ireland.
Royal College of Surgeons of England.
Royal College of Surgeons of Ireland.
Royal Institute of British Architects.
Royal Meteorological Society.
Royal University of Ireland.
St. John Ambulance Association.
Sanitary Association of Scotland.
Sanitary Inspectors' Association.
Sanitary Inspectors' Association, Northampton and adjoining Counties Branch.
Sanitary Inspectors' Association, Western Branch.
Sanitary Inspectors' Association, Yorkshire Branch.
Society of Chemical Industry.
Society of Engineers.
Society of Medical Officers of Health, Home Counties Branch.
Society of Medical Officers of Health, Northern Branch.
Society of Medical Officers of Health, Yorkshire Branch.
Society of Public Analysts.
University of Aberdeen.
University of Cambridge.
University of Durham.
University of Edinburgh.
University of Glasgow.
University of Wales.
University College, Bristol.
University College, Dundee.
University College, London.
University College of Wales.
Victoria University.
Yorkshire College.
Yorkshire Geological and Polytechnic Society.
Yorkshire Philosophical Society.

Proceedings of the Congress and Officers of Sections and Conferences.

ADDRESSES, LECTURES, & CONVERSAZIONE.

Inaugural Address to the Congress

By ROBERT FARQUHARSON, M.D.Edin., LL.D.Aberd., F.R.C.P.Lond., M.P., D.L., J.P.,

to be given in The Chemistry Class Room of Yorkshire College, *on Tuesday, September 14th, at* 3 *p.m.*

Conversazione and Reception

By THE LORD MAYOR OF LEEDS,

to be given in The Art Gallery, *on Wednesday September* **15*th*, *at* 8.30 *p.m.***

Lecture to the Congress

By H. PERCY BOULNOIS, M.INST.C.E., **City Engineer, Liverpool.**

to be given in The Albert Hall, *on Thursday, September 16th, at* 8 *p.m.*

Popular Lecture,

By PHILIP BOOBBYER, M.B., M.R.C.S., **Medical Officer of Health, Nottingham,**

to be given in The Albert Hall, *on Friday, September 17th, at* 8 *p.m.*

SECTIONAL MEETINGS.

Sect. I.—"Sanitary Science & Preventive Medicine."

September 16th and 17th, to be held in The Town Hall.

President.

T. Pridgin Teale, M.A., M.B.OXON., F.R.C.S., F.R.S.

Vice-Presidents.

T. Churton, M.D. (**Senior Physician Leeds General Infirmary**).
Prof. E. M. Crookshank, M.A., M.R.C.S., J.P.
Counc. B. Heald, M.R.C.S.
Alderman J. S. Loe, M.R.C.S. (**Chairman of Hospitals Sub-Committee**).
Allan Macfadyen, M.D., M.R.C.S., B.SC., F.I.C.
Alderman J. Ward, J.P.
Col. Edmund Wilson.
G. Sims Woodhead, M.D., F.R.C.P., F.R.S.E.

Secretaries.

Counc. A. Hawkyard, L.R.C.P., L.R.C.S.
Leeds.
Prof. E. F. Trevelyan, M.D., B.SC.
Leeds.

Recording Secretary.

J. F. J. Sykes, D.SC., M.D., London.

Section II.—"Engineering and Architecture."

September 16th and 17th, to be held in The Town Hall.

President.

Lewis Angell, M.INST.C.E., F.R.I.B.A.

Vice-Presidents.

Prof. A. Barr, D.SC., M.INST.C.E.
Councillor Batley (**Chairman of Building Clauses Committee**).
Geo. Corson (**President of the Leeds and Yorkshire Architectural Society**).
D. M. Gaskin, M.INST.C.E.
Malcolm Paterson, M.INST.C.E.
John Richardson, M.INST.C.E., F.S.I.
Keith D. Young, F.R.I.B.A.

Secretaries.

F. W. Bedford, A.R.I.B.A.
Leeds.
A. E. Nichols, ASSOC.M.INST.C.E.
Leeds.

Recording Secretary.

Major Lamorock Flower, F.R.MET.SOC., London.

Section III.—"Chemistry, Meteorology, and Geology."

September 16th and 17th, to be held in The Town Hall.

President.

William Whitaker, B.A., F.G.S., ASSOC.INST.C.E., F.R.S.

Vice-Presidents.

Rev. W. Lower Carter, M.A., F.G.S.
Thomas Fairley, F.R.S.E., F.I.C.
David Forsyth, M.A., D.SC.
Prof. C. Kelly, M.D., F.R.C.P.
E. A. Letts, PH., D.SC., F.R.U.I.
Prof. Vivian Lewes, F.I.C., F.C.S.
Samuel Rideal, D.SC., F.I.C., F.C.S.
Walter Rowley, F.G.S., M.INST.C.
Prof. Arthur Smithells, B.SC., F.I.C.
Prof. Wm. Stroud, D.SC., M.A.

Secretaries.

F. W. Branson, F.I.C.,
Leeds.

F. W. Richardson, F.C.S., F.R.M.S.,
Bradford.

Recording Secretary.

Bushell Anningson, M.A., M.D., Cambridge.

CONFERENCES.

On River Pollution.

Wednesday, September 15th, to be held in The Town Hall.

President.

Major Lamorock Flower, F.R.MET.SOC.,
Sanitary Engineer Lee Conservancy Board.

Vice-Presidents.

Right Hon. Lord Abinger (President Fisheries Preservation Association).
Alderman Anderton, C.C. (West Riding Rivers Board).
Alderman C. Burt, J.P. (Thames Conservancy Board).
E. Rider Cook F.I.C., F.C.S., J.P. (Chairman Lee Conservancy Board).
Alderman C. Milnes Gaskell (Chairman West Riding of Yorkshire Rivers Board).
T. H. W. Idris, J.P. (Chairman of Rivers Committee, L.C.C.).
Alderman W. H. Jessop, J.P. (Chairman, Health Committee, Huddersfield).
Sir Vincent Hunter B. Kennett-Barrington, M.A.
Councillor Knowles (West Riding Rivers Board).
R. A. Tatton, M.INST.C.E. (Chief Inspector Mersey and Irwell Joint Committee).
J. Willis Bund (Chairman River Severn Conservancy Board).

Secretaries.

W. Arnold Evans, M.D., D.P.H.,
Bradford.

H. Maclean Wilson, M.D., B.SC.,
Wakefield.

Recording Secretary.

W. Collingridge, M.D., M.A., L.L.M., D.P.H., London.

Of Municipal Representatives.

Wednesday, September 15th, to be held in THE TOWN HALL.

President.

Councillor B. WOMERSLEY,
Chairman of the Sanitary Committee of the Leeds City Council.

Vice-Presidents.

ALD. W. COOK (Chairman of the Health Committee, Birmingham).
E. H. COOKSON, J.P. (Chairman of the Health Committee, Liverpool).
SIR JOSEPH EWART, M.D., F.R.C.P., J.P. (Vice-Chairman Brighton School Board).
FORTESCUE FLANNERY, M.P.
E. B. FORMAN, M.D. (Chairman of Public Health Committee, L.C.C.).
ALD. H. W. NEWTON, J.P. (Chairman of Sanitary Committee, Newcastle upon-Tyne).
HENRY SUGDEN, J.P.
JOHN URE, L.L.D.

Secretaries.

Recording Secretary.

H. H. COLLINS, F.R.I.B.A., LONDON.

This Conference is open to all Members and Officials of Municipal Bodies.

Of Medical Officers of Health.

Wednesday, September 15th, to be held in THE TOWN HALL.

President.

EDWARD SEATON, M.D., F.R.C.P., F.C.S.

Vice-Presidents.

E. W. HOPE, D.SC., M.D.
J. R. KAYE, M.B., D.P.H.
HARVEY LITTLEJOHN, M.D., B.SC.
J. WRIGHT MASON, M.B., D.P.H.
J. B. RUSSELL, B.A., L.L.D., M.D.
HENRY WHITAKER, M.D., M.R.C.S., D.P.H.
J. MITCHELL WILSON, M.D., D.P.H., F.C.S.
H. de C. WOODCOCK, M.R.C.S., L.R.C.P.

Secretaries.

E. G. ANNIS, M.R.C.S., L.R.C.P., D.P.H., HUDDERSFIELD.
W. L. HUNTER, B.A., M.D., D.P.H., PUDSEY.

Recording Secretary.

HENRY KENWOOD, M.B., D.P.H., LONDON.

This Conference is open to all Medical Officers of Health

Of Municipal and County Engineers.

Wednesday, September 15th, to be held in THE TOWN HALL.

President.

THOMAS HEWSON, M.INST.C.E.

Vice-Presidents.

R. BINNIE, M.INST.C.E., F.G.S.
BRETLAND, M.INST.C.E.
COX, M.INST.C.E.
EER, ASSOC.M.INST.C.E.

T. DE COURCY MEADE, M.INST.C.E.
E. R. S. ESCOTT, M.INST.C.E.
A. B. MCDONALD, M.INST.C.E.

Secretaries.

EARDEN, ASSOC.M.INST.C.E., .I.B.A., DEWSBURY.

T. W. STAINTHORPE, ASSOC.M.INST. C.E., GRANGETOWN.

Recording Secretary.

CHARLES MASON, ASSOC.M.INST.C.E., A.R.I.B.A., LONDON.

This Conference is open to all Municipal and County Engineers.

Of Sanitary Inspectors.

Wednesday, September 15th, to be held in THE TOWN HALL.

President.

PETER FYFE, F.R.S.EDIN. (Chief Sanitary Inspector, Glasgow).

Vice-Presidents.

BRANSON (Chairman Northampton and Adjoining Counties Branch Sanitary ectors' Association).
TH CAMERON (President of the Sanitary Inspectors' Association of Scotland).
MBERS (Chief Sanitary Inspector, Bradford).
. COWDEROY (Chairman, Worcestershire Branch Sanitary Inspectors' Association).
HAM (Sanitary Inspector and Surveyor, Aberford).
ES MACMAHON (Chairman, Western Branch Sanitary Inspectors' Association).
HAWCROSS (Chairman, Lancashire and Cheshire Branch Sanitary Inspectors ciation).
LLOW (Chief Sanitary Inspector, Leeds).
TRAVIS (Chairman, Yorkshire Branch Sanitary Inspectors' Association).
QUHART (Chairman, North-Western and Midland Sanitary Inspectors' Association).
WELLS (Chairman Northumberland and Durham Branch Sanitary Inspectors' ciation).
WEST (Chairman of The Sanitary Inspectors' Association).
KINSON (Sanitary Inspector and Surveyor, Altofts).

Secretaries.

DLEY (Sanitary Inspector), BATLEY.

FREDK. B. ROTHERA (Surveyor and Sanitary Inspector), SOWERBY BRIDGE.

Recording Secretary.

ALBERT TAYLOR (Sanitary Inspector).

Conference is open to all Sanitary Inspectors and Inspectors of es.

On Domestic Hygiene.

dnesday, September 15th, to be held in THE BOARD ROOM OF LEEDS BOARD SCHOOL.

President.

Vice-Presidents.

iss M. BAINES.
rs. CONNON.
rs. J. E. EDDISON.
rs. R. W. EDDISON.
rs. GIBSON.

Mrs. JACKSON.
Mrs. LEUTY.
Mrs. COPSON PEAKE.
Mrs. B. WOMERSLEY.
Mrs. WOODHOUSE.

Secretaries.

rs. WOODHAM BEST.

Mrs. FENWICK.

Conference is open to all Ladies interested in Domestic Hygiene.

Order of Proceedings.

TUESDAY, SEPTEMBER 14TH.

12.30 p.m.—**Reception of the Members of the Congress in the Town Hall.**

1.30 p.m.—**Public Luncheon in Large Hall, Yorkshire College.**

3 p.m.—**Inaugural Address to the Congress in Yorkshire College.**

8.30 p.m.—**Opening of the Exhibition in the Camp Road Buildings.**

WEDNESDAY, SEPTEMBER 15TH.

10 to 1, and 2 to 5 p.m.—**Conferences in The Town Hall.**
(See pages 242, 243.)

8 p.m.—**Conversazione and Reception in the Art Gallery by the Right Honorable the Lord Mayor.**

THURSDAY, SEPTEMBER 16TH.

10 to 2 p.m.—**Meetings of Section I.** *(See page* 240.)—**Sanitary Science and Preventive Medicine. Section II.—Engineering and Architecture. Section III.—Chemistry, Meteorology, and Geology in The Town Hall.**

Presidents' Addresses, Papers and Discussions.

8.30 p.m.—**Lecture to the Congress in The Albert Hall.**

FRIDAY, SEPTEMBER 17TH.

10 to 2 p.m.—**Meetings of Section I.—Sanitary Science and Preventive Medicine. Section II.—Engineering and Architecture. Section III.—Chemistry, Meteorology, and Geology in The Town Hall.**

5 p.m.—**Closing General Meeting of the Congress in The Town Hall.**

8.30 p.m.—**Popular Lecture in The Albert Hall.**

SATURDAY, SEPTEMBER 18TH.

Excursions.

Excursions and Visits to places of interest will be made during the Congress.

[*Particulars will be given in future Programmes.*]

ΗE HEALTH EXHIBITION

WILL BE HELD IN

LEEDS,

On TUESDAY, SEPTEMBER 14th, and will remain open till OCTOBER 9th, 1897.

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he Exhibition is held in connection with the Sixteenth
in Congress of The Sanitary Institute, and includes Sanitary
itus and Appliances, and Articles of Domestic Use and
my.

he Principal Boroughs throughout the Kingdom will send
tes to the Meeting, and probably over five hundred repre-
ves will be present in addition to the Members and ordinary
, so that the Exhibits will be brought under the notice of
rs of Corporations and Officials from all parts of the country.

IAMOND JUBILEE.—As the progress of Sanitary Science
en largely associated with the Victorian Era, it is thought to
ting opportunity to illustrate, by means of contrast and other-
e greatest advance made during that period. The Committee
glad (as far as practicable) to grant facilities to Exhibitors
ay be able to show apparatus or appliances illustrating such
ts.

e Building is well adapted for an attractive Exhibition.

pplications for Space must be made on the Official Form
der the proper Class. They must be sent to Mr. W. H.
r, the Curator of the Exhibition, at the Offices of the
e, Margaret Street, London, W., not later than Saturday,
21st, 1897.

e Scale of Charge for Floor Space will be 15s. per Foot
e, with a depth of six feet. Corners and Special Places will
ged at higher rates. Wall space, 1s. per square foot. No
pace will be allotted for less than three feet frontage, or
pace for less than five square feet. *All charges must be paid*
me of allotment.

lver and Bronze Medals will be awarded at the dis-
of the Judges, and their decisions will in all cases be final.
lete classified List of all Awards from the commencement of
es of Exhibitions is published by the Institute.

otection in accordance with the Patents, Designs, and
Marks Act, 1883, will be obtained from the Board of Trade
ons desirous of exhibiting New Inventions.

rms of Application for Space and other particulars can be
l of the Curator at the Offices of the Institute, 72, Margaret
W.

MEMBERS AND ASSOCIATES ELECTED.

From April to June, 1897, inclusive.

MEMBERS (Mem. San. Inst.)

* Passed Examination in Practical Sanitary Science.

‡ Passed Examination as Inspector of Nuisances.

1897. June. *[illegible], Stephen Isaac, *Ravenhurst, York Road, Southend-on-Sea.*

1897. May. [illegible], J. H., [illegible], *Longton, Stafford.*

1897. May. [illegible], William, D.P.H., M.O.H., *Appleton Cottage, Widnes.*

1897. May. [illegible], James Stewart, *Borough Surveyor, Rock-[illegible].*

1897. June. [illegible], Captain Henry George, *Bicester House, [illegible].*

1897. May. [illegible], Alexander G. R., F.R.C.S., D.P.H., CAMB., *[illegible] Mansions, Victoria Street, S.W.*

1897. June. [illegible], Frederick Thomas, CERT. M. & C.E., *[illegible] Villas, Buckland Hill, Maidstone, Kent.*

1897. May. *[illegible], T. W. A., *Lynton Villa, Weston-super-Mare.*

1897. Apr. [illegible], William, CERT. ASSOC. M. & C.E., *Irchester Road, Rushden, Northampton.*

1897. May. [illegible], H. O., M.O.H., 19, *Winckley Square, Preston.*

1897. Apr. Porter, Charles, M.D., M.O.H., *Victoria Park, Stockport.*

1897. Apr. Quirk, Charles James, 16, *Westmoreland Street, Dublin.*

1897. June. [illegible], Friend Edward, M.R.C.S., L.R.C.P., M.O.H., [illegible], *Swindon, Wilts.*

1897. Apr. *Vine, Harry A. E., 87, *Charlwood Street, Pimlico, S.W.*

1897. June. *Wright, Alfred, 97, *Newington Green Road, S.E.*

1897. May. *Young, Robert, 6 & 7, *Queen Street, Neath, Glam.*

1897. June. ‡Younger, Edward George, M.D., M.R.C.P., D.P.H., 19, *Mecklenburgh Square, W.C.*

ASSOCIATES (Assoc. San. Inst.)

‡ Passed Examination as Inspector of Nuisances.

1897. June. Abrams, Herbert John Sinclair, 3, *Fitzjohn's Esplanade, South Hampstead, N.W.*

1897. June. ‡Atkinson, Edward Harold, 33, *Marshfield Road, Goole.*

1897. June. ‡Beacham, William Ernest, *Bridge Street, Abercarn, near Newport, Monmouth.*

1570 1897. May. Bland, William Elgie, *Barras Bridge, Newcastle-upon-Tyne.*

1580 1897. June. ‡Blundell, Tom, 28, *Hall Road, Handsworth.*

1556 1897. Apr. ‡Bush, Walter Ernest, 1, *Chester Villas, Farnborough, Kent.*

1591 1897. June. ‡Carr, William Henry, 2, *Albert Villas, Milton Street, Southend-on-Sea.*

1571 1897. May. ‡Eastwood, James, *Luddenden, Manchester.*

1559 1897. Apr. ‡Evans, David Lewis, 19, *Richardson Street, Swansea, Glam.*

1572 1897. May. ‡Finch, Ernest Edward. *Town Hall, Bermondsey, S.E.*

1592 1897. June. ‡Hargreaves, Elijah, 32, *Adelaide Street, Crawshaw Booth, Rawtenstall.*

1560 1897. Apr. ‡Hobson, Miss Rose A., 5, *Endsleigh Street, Tavistock Square, W.C.*

1584 1897. June. ‡Howard, Samuel, *Rake Lane, Bromborough, Cheshire.*

1573 1897. May. ‡Hudson, Alfred, *Council Offices, Nuneaton.*

1561 1897. Apr. ‡Hughes, William John, 73, *Bailey Street, Tonpentre R.S.O., Glamorgan.*

1593 1897. June. ‡Hutchinson, Miss Harriet Jane, *Fern Bank, Corporation Oaks, Nottingham.*

1594 1897. June. ‡Jones, William Collin, *Bryn Dinas, Trealaw, Rhondda Valley, Glamorgan.*

1562 1897. Apr. ‡Jones, William Robert, 49, *Bousfield Road, S.E.*

1595 1897. June. ‡Linford, Arthur Banks, *Kelvin Cottage, Wombwell, near Barnsley.*

1557 1897. Apr. ‡Makepeace, William Henry, *Hatton, Warwick.*

1574 1897. May. ‡May, H. H., 49, *Albert Road, South Norwood, S.E.*

1563 1897. Apr. ‡May, William, J., F.R.G.S., 24, *Sparsholt Road, Crouch Hill, N.*

1579 1897. May. ‡McInnes, Donald, *Kilpatrick, Craignure Mull, N.B.*

1587 1897. June. ‡Meadway, Frederick William, *The Vestry Hall, Church Row, Bethnal Green, E.*

1566 1897. Apr. ‡Morris, James, 248, *Waterloo Street, Bolton.*

1596 1897. June. ‡Nightingale, John, 36, *Clarence Street, Manchester, Lancs.*

1597 1897. June. Owner, John, 11, *Market Parade, Gloucester.*

1564 1897. Apr. ‡Price, David, *Upper Trostree, Talgarth, Brecon.*

1598 1897. June. ‡Price, George, *Station Road, Harborne, Birmingham.*

1565 1897. Apr. ‡Price, Matthew David, 54, *High Street, Ferndale R.S.O., Glamorgan.*

1581 1897. June. ‡Roberts, John, *Midland Truant School, Lichfield, Staffs.*

1589 1897. June. ‡Ronald, David, *Falkirk, Stirling.*

1575 1897. May. ‡Ross, Harry A., 3, *Park Street, Dorset Square, N.W.*

1600 1897. June. ‡Sainsbury, George Henry, *Sanitary Department, Municipal Buildings, Leeds.*

1599 1897. June. ‡Stephens, H. Salter, 228, *New North Road, Islington.*

1580 1897. May. ‡Stroud, Arthur, 23, *Grosvenor Road, Richmond, Surrey.*

1565 1897. Apr. ‡Stupart, Charles Walter, 4, *Plymouth Road, Totnes, Devon.*

1578 1897. May. ‡Sumner, John, 100, *Wigan Lane, Wigan.*

1576 1897. May. ‡Sutton, Geo., *Pelsall, Walsall.*

1566 1897. Apr. ‡Warne, Maurice Cuthbert, *Castle House, Sidmouth, Devon.*

1577 1897. May. ‡Waterman, Richard Henry, 31, *Annerley Terrace, Somers Road, N., Portsmouth.*

1589 1897. June. ‡Willett, Alfred James, 247, *Bethnal Green Road, E.*

1586 1897. June. ‡Woodhouse, Tom, *Duffield, Derbyshire.*

EXHIBITS ADDED TO THE MUSEUM.

APRIL—JUNE, 1897.

DIVISION A.

Geology.

Strata of London Basin. Specimens of Soils, &c., with data as to their varying depths at the points indicated. These specimens were obtained in the process of boring for water, and represent typical strata in the London Basin. The Exhibit is arranged in two series:

No. 1.—Well at Messrs. Idris & Co.'s, Pratt Street, Camden Town, N.W.

	Depth of Stratum. Feet.	Total Depth.		Depth of Stratum. Feet.	Total Depth.
Made ground ..	5	5	Mottled clay......	29	128
Yellow clay	4	9	Green sand	6	134
Gravel	1	10	Grey sand........	19	153
Yellow clay	12	22	Flints	2	155
Blue clay	77	99	Chalk and flints ..	209	364

No. 2.—Well at Hornsey Baths, Hornsey Road, N.

Made ground ..	3	3	Dark clay	4	119
Brown clay	30½	33½	Yellow clay	8	127
London clay	26½	60	Blue clay	4	131
Clay and stone ..	1	61	Green sand	17	148
London clay	44	105	Sandy clay & pebbles	22	170
Sandy Clay	4	109	Running sands....	22	192
Mottled clay....	6	115	Chalk	258	450

C. Isler & Co.

DIVISION B.

Municipalities.

Destructor Furnace (Drawing). Beaman & Deas' Patent for destroying House and Town refuse and generating Steam. *Beaman & Deas' Synd., Ltd.*

DIVISION C.

Drain Pipes and Accessories.

Drain Pipe, "4-inch." Stopped with roots of a tree. *F. Rayner.*

Iron Pipe, "Corroded." The Specimen was taken from a water service-pipe conveying hard water. *F. Rayner.*

Miscellaneous.

Moss Litter. Two miniature Bales prepared for use, and a specimen of Unprepared Turf. These specimens illustrate the products of the Norwegian Moors south of Kristiania. The coarser material is extensively used for Stable Bedding, and the finer for Earth Closets, &c. *Harry A. Ross.*

CONTRIBUTIONS AND ADDITIONS TO LIBRARY

FROM APRIL TO JUNE, 1897.

⁂ *For publication of Societies and Institutions, &c., see under "Academies."*

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Bath, 1896	*W. H. Symons, M.D.(Brux.), D.P. (Oxon).*
Batley, Sanitary Inspector, 1896	*J. Lindley.*
Birkenhead, 1896	*R. Sydney Marsden, D.Sc., F.R (Edin.).*
Birmingham, 1896	*Alfred Hill, M.D., F.R.S.E.*
Bridlington U.D.C., 1896	*W. A. Wetwan, M.R.C.S.*
Bridlington Union, 1896	" " "
Brighton, 1896	*Arthur Newsholme, M.D.*
Bromley R.D.C., 1896	*James Scott Tew, M.D., D.P.H.*
Cardiff, 1896	*Edward Walford, M.D., D.P.H.*
Coventry, 1896	*The Town Clerk.*
Cranbrook R.D.C., 1896	*James Scott Tew, M.D., D.P.H.*
Eccles, 1896	*J. H. Crocker, M.D., D.P.H.*
Exeter, 1896	*John Woodman, M.D.*
Hackney, 1896	*J. King Warry, M.D., D.P.H.*
Hastings, 1896	*Town Clerk.*
Huddersfield, 1896	*E. G. Annis, M.R.C.S., D.P.H.*
" 1st Quarter, 1897	" " "
Kidderminster, 1896	*David Corbet, M.R.C.S.*
Lambeth, 1896	*J. Priestley, B.A., M.D., D.P.H.*
Maidstone, Sanitary Inspector, 1896	*W. Jackling.*
Maidstone R.D.C., 1896	*James Scott Tew, M.D, D.P.H.*
Newcastle-upon-Tyne, 1896	*H. E. Armstrong, D.Hy.*
New Windsor, 1896	*Edward Casey, M.D.*
Norwich, 1896	*H. Cooper Pattin, M.A., M.B., D.P.*
Ormskirk R.D.C., 1896	*Herbert Peck, M.B., D.P.H.*
Poplar District Board of Works, 1896	*F. W. Alexander, D.P.H.*
River Tyne P.S.A., 1896	*W. E. Harker, M.D., B.S.*
Roxburgh, County Sanitary Inspector, 1896	*Adam Morris.*
St. Mary, Stoke Newington, Sanitary Inspector, 1896	*S. E. Burgess, A.M.I.C.E.*
St. Mary, Stoke Newington, 1896	*Henry Kenwood, M.B., D.P.H.*
Sevenoaks R.D.C., 1896	*James Scott Tew, M.D., D.P.H.*
Sevenoaks U.D.C., 1896	" " "
Southborough, 1896	" " "
Southport, 1896	*H. H. Vernon, M.D., F.R.S.E.*
Sunderland, 1896	*Harold Scurfield, M.D., D.P.H.*
Tenterden U.D.C., 1896	*James Scott Tew, M.D., D.P.H.*
Tonbridge, 1896	" " "
Tonbridge R.D.C., 1896	" " "

Tonbridge U.D.C., 1896 ..	.. *James Scott Tew, M.D., D.P.H.*
West Bromwich, 1896 ..	.. *Herbert Manley, M.A., M.B., D.P.H.*
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GENERAL NOTES.

INSPECTION OF MEAT.—The Report of the late Royal Commission on Tuberculosis showed the great necessity that exists for the adoption of proper administrative methods designed to prevent the sale of meat from tuberculous animals, or of meat from healthy animals that has become infected by the slaughterers from diseased carcasses in the processes of dressing.

The Council of The Sanitary Institute has for long recognised that a course of instruction in meat inspection formed a most essential part of the technical education of Sanitary Inspectors, to whom large powers of condemnation are entrusted by the existing Public Health Acts, and to whom will be relegated in many instances those larger duties in connection with public abattoirs which are likely to be a feature of the municipal methods of the near future. The Council, therefore, in the Spring of 1896, organised, in connection with the Sanitary Officers' lectures, special demonstrations, held at the Institute, for the inspection of meat. The students also were taken, under competent guidance, to one of the London meat markets to see the methods of preparing meat for sale; and demonstrations were given as to the appearances and physical characteristics of healthy meat, and where to look for, and how to recognise, abnormal appearances indicating disease and unsoundness. The demonstrations given in the Museum of the Institute were rendered possible by the kindness of Medical Officers of Health in various parts of the country, in sending up carcasses and portions of animals affected by various diseases. These specimens were carefully explained to the students by the lecturer, and the students were afforded the opportunity of handling and closely examining the various tissues both before and after the demonstration.

The following are some of the diseases which have been illustrated:—Cysticerci, Trichinæ, Hydatid Cysts of Lungs and Liver, Flukes, Tuberculosis of Lung, Pleura, Udder and Lymphatic Glands, Swine Fever, Septicœmia, Milk Fever, Inflammatory Womb of Cow, Pericarditis, Fibroid Tumour, Joint Ill, Joint Felon, Broncho-Pneumonia, Ankylosis, Slink Meat.

The numbers of students attending the demonstrations at the Meat Market in the three sessions were 77, and at the Museum 233.

Many of the specimens have been preserved for permanent exhibition in the Museum by immersing them (1st) for 24 hours in formalin; (2nd) for 12 hours in 80 per cent. alcohol; (3rd) for 2 hours in 95 per cent. alcohol; and finally bottling them in a solution of equal parts of water and glycerine. This process has been found advantageous for fixing the colour of the specimens, and for preserving their normal appearances. For the better preservation of the carcasses sent to the Museum for demonstration, a large cold storage chamber, with well packed double walls, has been specially constructed in the basement. By means of ice, specimens may be preserved in this chamber for several days, even in warm weather. Convenient tables for dressing and arranging specimens have also been provided.

L. C. P.

THE YELLOW FEVER BACILLUS. MONTEVIDEO, JUNE 10.—Dr. Sa
delivered a lecture here to-day upon the etiology and pathogenesis of
fever. There was a very large attendance, including a number of sci
delegates from all parts of South America, the members of the Dipl
Body, and the principal authorities. Dr. Sanarelli stated that he had
the problem which he had set himself, and declared the cause of yellow
to be a bacillus named by him icteroid, which was rarely found either
blood of yellow fever patients or in their bodies after death, as it easily
peared. The isolation of the microbe was difficult, but bacteriol
diagnosis was possible. Twenty-four hours' cultures in gelatine were
nizable without a microscope. The microbe was very deadly for an
producing when experiments were made a cyclic malady with symptom
lesions identical with those produced in man—namely, gastro-enterini
morrhage, nephritis, uræmia, and fatty degeneration of the liver, destroyi
hepatic cell-like phosphorus, and thus suppressing the natural defence
organism. Filtered cultures set up in animals and man the same t
fever. He had made experiments which showed that the acclimati
of the malady on board ship and in damp places was due to the syn
of the microbe with mould, a damp atmosphere favouring the mi
development and vitality. Vaccination of large animals was difficult.
year was necessary for a horse, one month for small animals. Small d
toxine producing immunity in man might be possible, and Dr. Sanarel
that he would shortly make experiments in preventive vaccination and
to discover a curative serum.

The discovery of the bacillus is regarded as a most memorable on
the doctor's lecture was received with great enthusiasm. A grand b
was given this evening by the medical society in Dr. Sanarelli's hon
Times June 12th, 1897.

NOTIFICATION OF INFECTIOUS DISEASES.—The following questio
asked in the House of Commons on May 13th: Sir J. Brunner (Ch
Northwich) asked the President of the Local Government Board how
local authorities had adopted the Notification of Infectious Diseases A
what proportion that number was of the whole number empowered to
it.

Mr. Chaplin (Lincolnshire, Sleaford).—Excluding London, where th
fication of infectious disease is compulsory under the Public Health (Lo
Act, 1891, the Local Government Board have, up to May 11th, 1897, re
information of the adoption of the Infectious Disease (Notification) Act
in 654 rural districts out of a total of 671 rural districts, and in 904
districts out of 1,088 urban districts. But in 49 of the 184 urban di
where the Act of 1889 had not been adopted the notification of inf
disease is compulsory under provisions in local Acts.

me XVIII.—Part III.] [OCTOBER, 1897.

JOURNAL
OF
HE SANITARY INSTITUTE.

CONGRESS AT LEEDS.

INAUGURAL ADDRESS,

ROBERT FARQUHARSON, M.D.EDIN., LL.D.ABER., F.R.C.P.LOND., M.P., D.L., J.P.

Delivered September 14th, 1897.

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feelings on rising to address you this afternoon are somewhat d. In the first place pride and pleasure at the dignified responsible position in which I find myself press to ront, and I venture, although not very confidently, to hope I may be able to use this platform as an authoritative ne from which to speak words which may be suggestive if weighty. Such an opportunity probably only occurs once lifetime, and it may well be a subject for anxious reflection best to use, without abusing, the indulgence of the ntial audience I see before me. But secondly, other con- itions have urgently claimed my attention since Sir Douglas n first whispered into my ear the tempting offer of this lential chair, and as this day drew nearer, they also came r to my mind. Had I been the first to apply the spade to rgin soil of sanitary exposition, I should have felt easier when I cast my eye over the vast field that lies before us, bserved who they are who have preceded me in the rer's task.

r my own peace of mind, I have not gone back further the last two years, but it is enough to fill me with dismay I see how comprehensively and plausibly my two im- te predecessors have anticipated the lines along which I l like to have asked you to travel to-day. When I come end of my observations, I shall feel almost inclined to the example of a new Irish member, who, getting a little sed by the exuberance of his own verbosity, was pulled up two or three times from the chair for irrelevance. Ga himself together at last for a final effort he rose once his legs and made this plaintive appeal:—"Mr. Speal you be pleased to allow me to recapitulate what I *int* say."

Sir Francis Powell is of a different political comple myself, but, on sanitary questions we sit upon the same the house, and for years past I have been accustomed upon him as my guide, philosopher and friend. He t Liverpool audience that his remarks were written du short holiday on the continent, with but few books a But I think we may congratulate ourselves that he w pelled to fall back on the resources of his well-stored which merely has to be squeezed to give forth copio fertilising streams of knowledge and experience, ar Percy, whose distinguished and useful career I well rei in the House of Commons, furnished to Newcastle a str able and statesman-like address, referring more particu the vaccination question, in which he always took a ke intelligent interest. But my anxiety did not end w survey of the congress literature for 1895 and 1896.

The responsibility of an introductory orator on s occasion as this is much increased by the fact that hygi now become fashionable, and that most people nowaday at all events the elementary principles on which it work great subjects like this and more especially those which some dislocation of antiquarian superstition and d prejudice, must pass through a variety of stages, or cyc varying waves of interest beat on the mental shore.

First we have the stage of ridicule, a difficult one to g but which in spite of new humourists and funny soci "joking wi' ponderous difficulty" we have at last succ surmounted. I do not mean to say that there is not st gentle chaff floating about, as when some parliament league says to me, "They were talking about stinks las in the House and you ought to have been there," a reply invariably is, that they are paying me a real comp for not only am I proud of representing, however feebly, health, but because in order to make any kind of among the competing ranks of the green benches, it is ne above all things to take up some specific subject, fad, if y to call it, and stick to it in and out of season, until you identified with it, and then when one of your topics co for discussion, you readily catch the Speaker's eye and and retain a respectful hearing. For this is emphati specialising age.

Next we find that when the general public recognize that
are in dead earnest, and have come to stay, the stage of
ive opposition sets in, and vested interests and pig-headed
orance, and the self-complacent argument of "why not let
alone," are marshalled in warlike array against the new
om which tries to sweep the Augean stable clean, and really
king backwards we can hardly wonder at the slow move-
nt of people's minds in favour of sanitary progress. Poets
l novelists have cast a halo of chivalry and romance around
ditions of dirt and discomfort which must have made the
s even of knights and barons barely worth living two
turies ago. Old prejudices die hard, and old-fashioned
ple do not like being disturbed in their belief in the old
er of things handed down to them by their forefathers. The
r old midden whose unsavoury fumes unlock a store-house of
rished associations cannot be cleared away without a struggle,
a howl of execration pursues the operations of Hygeia,
n she opens out festering courts and removes picturesque
-houses, and clears away mould and stagnation, and with
help of air and light and water wages war against the
es of disease.

ut we have now nearly out-lived all this: ventilators are
onger stuffed up, the working classes, no less than their
loyers, are beginning to be connoisseurs in the quality of
r atmospheric conditions; enjoy a good wash as much as a
versity graduate, and are fully prepared to appreciate the
ntages of hygienic house accommodation at other people's
nse, and so we have reached the stage of enthusiastic
ptance, and universal approval, and the sanitary reformer
much petted and caressed as he was formerly scouted and
ised.

ukes and earls compete for the honours of mayoralty.
rt ladies go a-slumming and flirt with the last-arrived
lus, and woe to the sixth standard schoolboy who cannot
cribe the requisite amount of cubic space per head, or ven-
e or sewer a Château en Espagne with scientific accuracy.
ciations like our own, and the National Health Society and
John's Ambulance Association, and able and zealous mis-
ries, have not spoken and written in vain; and now we live
age of sanitary progress, where the little knowledge, which
fe not dangerous, persuades its possessor of its scanty
nt, and tells him where to go to make good his deficiencies.
r instance, no properly instructed person in these
htened days, would dream of taking a house without a
ugh inspection of, and report on, its sanitary arrange-
ts; water analysis and food analysis keep us fairly free from

adulteration, and most of us know pretty well, or at all events know how to get the information, as to the amount of help given us by the law in keeping our health fairly sound.

For we must come to the conclusion, reluctantly perhaps, but inevitably, that the race *is* to the swift, and the battle to the strong, and that unless we are well equipped physically for the contest, we are out-paced and shoved aside, and laid on the shelf along with the other failures of the world. The well-worn quotation from Herbert Spencer sums up the whole case: "The first requisite of life is to be a good animal, and to be a nation of good animals is the first condition of national prosperity." The good animal forces his way to the front by the sheer force of pushful progression, and it is our duty both to ourselves and others to see so far as we can that our vital functions are maintained in good repair. For ourselves naturally, for each one of us has, or ought to have, our own place and our own work, which we fill or do, and the filling or doing which, according to our highest capacity, should be the supreme aim of our lives; and for others, because the sum of the success and progress of our country is made up of the vigour and intellect of the individuals which compose it, and each one of us has a right to expect that his neighbour will not only contribute his fair share to the efficient working of the universe, but that he will not hinder or obstruct others who are trying to do the same.

Mr. Goschen spoke some very useful words in his Rectorial address at Aberdeen, in which he told the working man, and by that I don't mean only the manual worker, that he must take care lest he is not outstripped by the German who takes far more interest in his work than he does; and reads, and thinks, and tries to perfect himself in it, and to rise higher on the strength of his acquired knowledge.

I am not one of those who believe in the "made in Germany" cry, for I believe we are holding our own and more; but if there is only a modicum of truth in what Mr. Goschen says, it is worth our consideration as sanitarians.

It is evident that physical work must be good or bad for the health, partly in proportion to the pleasure which it affords the worker, and the degree to which it satisfies his yearnings for a complete and useful life. The German is more highly technically trained than we are, and is therefore able to take more interest in what to the outsider seems a dreary round of mechanical drudgery; and like the Scotch farmer, he pursues a frugal life, living low, and sometimes thinking high, and contented with simple pleasures among which his daily work takes a high place. Now, I know nothing about industrial conditions abroad, d perhaps you may think that I am not much better instructed out home affairs, but I wish to make a couple of protests.

The first is against the monotony of modern labour, caused rtly, no doubt, by the rapid extension of labour saving chinery, but also largely due to what Dr. Beddoe, in his very ggestive "Address on Health" (Social Science Congress in inburgh, 1880) called the specialisation and minute subdivision employments. "The influence of this last alternative," he tinues, "on the health of the workman has never been roughly worked out. If not counteracted by some extent of eral education, or opportunity for employment of leisure, it st apparently tend to dwarf both body and mind by the roken monotony of action." There is food for reflection in , and I recommend it to your mental appetite and digestion.

'rotest No. 2 is against the doctrine, for which I think the le is primarily responsible, which was further elaborated by kin, and which is now, I understand, accepted by certain ions of labourists, to use a clumsy but convenient term. l that is that the workman should be paid the same wage, ther he works well or ill, whether he be clever or stupid, 'ul or clumsy, industrious or lazy. I must not enlarge on moral or social side of this dogma of some trades unionists, I am entitled to say that, in my opinion, it is hopelessly at ance with the common sense laws of health, and therefore I est against it. If you take away the stimulus of ambition the wish to excel in any pursuit or work, so much more the work become flat and stale if not unprofitable; and man knows that by showing a superior capacity and superior and energy, he cannot get ahead of the dull drone who s by his side, then he becomes a mere machine: his faculties stunted and sluggish and his physical perfection must also ecessity deteriorate.

it let us return to our good animal. By this I do not mean re mass of bone and muscle, whose brain plays second fiddle s body, and whose animal instincts suffocate the higher ual workings of his intellect. Nor a self-conscious prig cious of nature's workings, creeping because he fears to g," morbid and uneasy, and, at last upsetting each vital function in succession by the influence of that expectant attention h too often succeeds in paralysing the regular working of rgans. We prescribe an efficiently working machine, kept od repair, and ready at a moment's notice to do all that its ical and mental capacity render possible. Sometimes when ect on the elaborate and delicate construction of the human and the subtile interdependence of its various organs and tions, I marvel, not that we do not reach the statutory period of 100 years, but that we are alive at all. For we ar not nearly as simple as we used to seem to be. There was time when it was considered enough to have a healthily beatin heart, sound arteries, readily expansible lungs, a stomach t digest, a liver to secrete bile, kidneys and intestines to do certai scavenging work, and a brain to invent, and nerves to transmit and record nervous impressions—" mais nous avons chang tout cela," or, rather gone beyond it. Certain organs whic have spent the earlier portion of their career in the cold shad of unmerited obscurity, have now been invited to take a fron seat, as good or malevolent fairies, whose influence largely help or hinders human life.

Bone marrow, whose dietetic properties were more appreciate than its physiological necessity, is now known to form red bloo corpuscles, and the phagocytes, whose martial ardour protect us from bacilliary invasion, hail from the spleen, which wa formerly looked upon as a mere bit of padding shoved in t keep the other organs in their place. If the thyroid glan strikes work, myxœdema, one of the most disfiguring an depressing of maladies, makes its unwelcome appearance, an suspension of the functional activity of the pancreas is followe by diabetes.

The wasting misery of Addison's disease is directly depende on the efficient working of the supra renal capsules, and th liver and its control over the secretion of uric acid is th vulcano from which periodically blaze out explosions of gou Nature has no mean task in keeping all this elaborate anatomic and physiological net-work of complications in order, and s has a right to insist that if we do not do anything actively t assist her, we should not make passive resistance to her wor and so I think she must rejoice to see the popularity of hygie in this great year of social and loyal triumph, and to think ho intimately associated the progress in the art of preserving healt is with the 60 years of glorious and successful administratio which history will have to record as the reign of our belove Queen.

Some cautious people are beginning to fear lest we may b going ahead too fast; and that some day when we find ourselves in advance of public opinion it may be necessary to call a halt. I think we have already outlived the danger of this, for the early enthusiasm of Local Government and County Councils, and Medical Officers of Health and Sanitary Inspectors, would be most likely to run to excess, and I have not heard of any serious complaint. No doubt an occasional grumble is heard when water areas and drainage districts press rather heavily on the rates, and when the demands of the Sanitary Inspector are re than an impecunious "Laird's" exchequer can stand. t take it all over, our modern developments of sanitary ganisation have worked well, and have given general satis-tion, and I think we may trust the judgment and common se of those on the box-seat of the coach not to use their nt strength tyrannously. On the contrary, the impression general one, and is held by all except those in full possession the infallibility of inexperience and ignorance that our lern system of modified Home Rule has been of distinct rice to the community at large. At least I know what we ık in Aberdeenshire, where, however, it is just possible that may be exceptionally situated in having started our coach h a specially safe and able driver on the box, and an indus-us and capable team to draw us straight along the road. l speaking personally as a landed proprietor with a large nber of small farms, I must express the great benefit I have ived from having highly competent sanitarians at hand help and advise. But it is well always to have an *ocatus Diaboli* at hand, and he, or she, for ladies are pretty te nowadays, will probably ask this question: "It is all very talking about fashion and popularity and progress, can you w any tangible results? Is the human race any longer d, or better, or happier than they were in the good old days re-hygiene?" But first let me advise you, if any lingering le of romantic leaning towards the life conditions of liæval or Past-Mediæval England still haunts your mind, the ghost by diligent perusal of Simon's "English Sanitary itutions," and the "Health of Nations," in which the work Edwin Chadwick is reviewed by Richardson, that bright and lred spirit. And I guarantee that even if imagination still s the remote history of the past, you will thank your own s that your lines have been cast in the cleaner and santer places of the Victorian Era.

ut I have something better than vague, however bold, rtion to offer you, for there is no doubt that the average of life has been sensibly prolonged. During the last rter of a century the death-rate has been reduced from ut 22 to 18 per annum, and whilst I give you sanitarians r full meed of praise for having, by your excellent work, ished some diseases and lessened the incidence of others, we ors intend to claim some credit too. We diagnose disease ier and treat it far better, making much less demands on the stitutional vigour of our patients by our remedies, and ping in mind the good old principle that prevention is better n cure. For the future let Prof. Matthew Hay of Aberdeen ık. He writes to me, "Progress of the death-rate downwards must in the future be less than in the past. A death-rate o 10 per 1000 would mean that everybody born lived to 100 year or an average of that. Probably it will be found that th mutual elements of decay in men, as in all living things, which make eventually for death, independently of environment, will not permit of a lower general death-rate than about 14 to 1 even under the most favourable hygienic conditions reasonably attainable. So that by the time we have gone as far in reducing the death-rate as we have come in the past quarter of a century we shall have reached the ultimate minimum, but it will certainly not be in another quarter of a century."

I am afraid we shall not be here to see this first coming of the millennium, and we must leave to our successors the problem of how to pack away all the people into our tight little island; what to do with the unemployed and the paupers, and how to make both ends meet in the fierce competition which will then be going on.

"Better to bear the ills we have, than fly to others that we know not of."

We can thus see a considerable material gain, but I claim for hygiene more than the mere prolongation of life; the betterment of it, the heightening of the mere joy of living, the clear and bright outlook over the horizon which results from good health. I am a great believer in the influence of physica causes over human affairs, and I commend to some of you ingenious and industrious minds, the study of how far, at th supreme crisis of life some preventible derangement has marre some great career.

You remember in the Christmas Carol, how Scrooge wa visited by the ghost of his late partner, Jacob Marley, and ho at first he was incredulous about his actuality.

"You don't believe in me," observed the Ghost.

"I don't," said Scrooge.

"Why do you doubt your senses?"

"Because," said Scrooge, "a little thing affects them. A slight disorder of the stomach makes them cheats. You may b an undigested bit of beef, a blot of mustard, a crumb of chees a fragment of underdone potatoe. There's more gravy tha grave about you, whoever you are!"

And there is really sound philosophy in this.

I have lately been reading in Wolseley's very interesting "Decline and Fall of Napoleon," how the failures of the last two years of that great man's life, were caused by recurrent attacks of a mysterious malady, largely due I am sure, to his defiance of nature's laws, and I commend to your attention the following words of the commander-in-chief: "Those who know at real war is, know that an accidental pain in the stomach, a clod in the eye of either leader at the critical moment just 'ore a charge, may always decide the result." And Welling- ı referring to his great rival, said: "How much the fate of world depends upon the temper and passions of one man," l after all, temper and passions are often the result of ıporary and probably preventible physical causes. More ended and precise evidence can be found in the Reports of Local Government Board, where, under the skilful guidance Sir John Simon, and Sir George Buchanan, and Sir Richard ›rne Thorne, some of the most acute minds in England have n unravelling abstruse sanitary problems with the detective ıcity of Sherlock Holmes, and tracking out from clues sible to the ordinary eye, sanitary defects which were oning districts and embittering and destroying human life. these are scattered and not always accessible, and I strongly mend to your attention two capital little books, which strike nail very directly on the head. The first of these is 'our respected townsman, Mr. Pridgin Teale, who, in the rvals of a brilliant and successful surgical career has found : to preach the doctrine that a nation's health is a nation's lth, and to furnish a series of object lessons of the most r and practical, if alarming kind. The first edition of ıngers to Health" was published in 1878, and proceeded he principle enunciated in a quotation from Mrs. Jameson's ends of the Madonna, "that a few scratches with a pen are er than whole pages of the most elaborate description." ›onsists, as most of you know, of a "pictorial guide to estic sanitary defects," and graphic diagrammatic sketches illustrated by short clinical commentaries expounding and ›sing 70 grave defects in house sanitation. I well remember sensation the book made when it first came out, and I know as done a deal of good by opening people's eyes and noses, exciting a degree of interest in matters hygienic here, as as elsewhere, which will yield fruit during this congress. Teale puts his case thus:—

Having further traced illness amongst my patients to dalous carelessness and gross dishonesty in drain work, I ıme indignantly alive to the fact that very few houses are to live in. Moreover, the conviction stuck deeply into mind that probably one-third, at least, of the incidental ss of the kingdom, including perhaps much of child-bed ss, and some of the fatal results of surgical operations in ıitals and private houses (surgical calamities Sir James et would call them) are the direct result of drainage defects, therefore *can* and *ought* to be prevented. This book will show work defective from *ignorance* and work defective fro *dishonesty.*"

No doubt great improvements have been effected in th years which have elapsed since this was written. We have no local governments, and in every locality there is a highly traine medical officer of health, who devotes his whole time to sanita tion, and has a highly skilled technical band of lieutenants i the sanitary inspectors, whose status has been much raised, thei position made more secure, and their sense of responsibilit heightened by the higher estimation in which they are hel But we have not reached Utopia yet, and we must kee knocking at the door till they let us in.

The second book is by our esteemed friend and associat Prof. Corfield, one of the pioneers of sanitary progress, and it called "Disease and defective House Sanitation." It consists two short lectures, but it is crammed with suggestive matter, an he enumerates the following diseases as directly caused by th defects included in his title—Sore throats, Diphtheria, Scarl Fever, Blood poisoning, Puerperal Fever, Pneumonia, Diarrhœ Enteric Fever, and general malaise have all resulted from badl connected ventilating pipes, badly-trapped waste pipes, defecti drains, split soil pipes, foul pan water closets, and very frequentl from escapes of gas, a cause more especially of sore throats, ne to me, I must confess. But short of the more formidable diseas included in the list, and which can be readily diagnosed a treated, there is no doubt that ill-defined symptoms of malai and depression are often caused by sewer gas, or as Corfie puts it:—

"Sometimes the members of the family in a country hou have found that so far from getting refreshed and invigorat by their visit to the country, they have always felt depress and weakened, and generally out of sorts during their stay the country, more especially those members of the family w spent more time than the rest in the house."

Verily many of these old-fashioned country houses we and perhaps are, whited sepulchres, too often filled with de men's bones.

May I give you one other illustration. I think it was in 18 or '85 that serious complaints began to be made about th drainage and ventilation of the House of Commons. Ba smells were about, members got sleepy and seedy, and influen came in and spread, and grumbling became loud and genera A committee was appointed under the presidency of Sir Henr Roscoe, to investigate the whole question, and we had man sittings and took much evidence, and rambled through the drain much hampered in our operations by the fact that no pla ld be found, and we had to trace out their situation and angement as best we could. And then we came to report, d we had to tell the legislators on the basis of a very import- t investigation by the late Professor Carnelley, that they re actually breathing sewer gas, and that the sooner they put ir house in order the better for themselves and the country. £10,000 were voted *nem. con.*, Shone's ejectors cut us off from main sewer, and I make so bold as to claim for this sanitary ration, national importance in improving the health and per of our senators, enhancing the quality of their work, and ding to the increased efficiency of our public departments by reasing the administrative capacity of Parliamentary chiefs are responsible for the conduct of affairs.

Now, ladies and gentlemen, I have been optimistic long ugh, a sip of pessimism will do us no harm, and I have no bt that sitting on the benches before me, I will find some elligent minds who will not mind joining me in a mild mble. Many things are good, but not as they ought to be, best, in the best possible of all worlds. To put it plainly, at are the defects of modern civilisation? I have told you ny of the benefits. In the 17th century the death rate was to be 7 per cent., it is now about 18 per 1,000, but unfor- ately for many of us the advantage is mainly between the ages and 35, and our chances of reaching this maximum period longevity are distinctly increased. The majority of us are r than that, and we want to know what is to become of us, vital statistics do not give us much comfort, for after dle life, when we stand on the table land and look over the e, before stepping downhill, we do not live longer, and we ak down sooner. Why is this? One evil of civilisation is the dency to crowd into big towns, and Dr. Farr long ago showed t *cœteris paribus* the rate of mortality increases as the sity of population. As Dr. Beddoe puts it, "Men seem in this ate and country to be most healthy where they see least of h other, where they produce and convey the least infection; act, where the proportion borne by man to nature is the st insignificant." No doubt a country life is often dull and notonous, and the charms of town are numerous and varied, I have a shrewd suspicion that many an emigrant from to the other will end by agreeing with Professor Poore, t "as things go at present, there is very little doubt that agricultural labourer with his cottage and garden and 12s. eek (I may say in Scotland 15s. to 20s.), is infinitely better than the town artizan on 25s., who pays dearly for pigging overcrowded rooms in which a cleanly and decent existence npossible."—(*Rural Hygiene*).

Now we all know the drawbacks of big towns. Houses are dear and often bad, the air is usually poisoned with smoke—a nuisance on which Ernest Hart and others have expended much patience and labour, but which seems as far from being abated as it was twenty years ago, when we had congresses and exhibitions, and apparently a fair chance of getting something done.

Then there is the difficulty of sewage disposal and the pollution of rivers, which I am glad to think is to engage the attention of our Congress; and the multiplicity of local and public acts, some oppressive, some repressive, and some progressive, which Parliament and other bodies inflict on us year after year. To quote again from Dr. Poore's most interesting "Rural Hygiene," after enumerating 36 proved and frequently existing defects in our modern complexity of sanitary machinery, he writes: "The ingenuity of Sanitary Engineers has been exercised to save us from these dangers, and they have given us what they are pleased to call self-cleansing sewers, innumerable forms of traps, endless methods of ventilation, and disconnection on scientific lines, until the medical officer of health is expected to have at his finger ends all the knowledge of a patent agent and a plumbers' foreman. If apparatus never wore out, if ventilators never got stopped up, if traps never got unsealed by leakage, evaporation, or other cause, one might feel secure against the enemy which is ever at our gates, provided the study of bacteriology did not lead us to recognize that a few feet of filthy pipe may be as dangerous as a mile, and that a trap may possibly serve, especially in hot weather and when the family is away, as a most efficient "cultivating chamber."

This is suggestive, though depressing, but it has its bright side. No doubt it is dangerous to be placed within easy reach of receptacles of foul air and sewer gas, as we all are, and necessarily must be, under the system of water-borne sewage common to our great towns, but the greater the risk, the greater should be the care exerted to keep it off. It is no pleasant thing to work in a dynamite factory or to live under atmospheric conditions below ground which repay carelessness by suffocation on the one hand, or shattering explosions on the other; but accidents when they do occur are nearly always preventible, and should be vanished from our industrial history. It would be a good thing if workmen, and more especially those who manufacture the complicated net-works of machinery which modern hygiene requires, should not only feel but carry into practice, the full sense of responsibility resting on them in connection with their trade. And that they should be taught

w a bit of scamped work—a leaking cess-pool, a badly
ced or constructed drain, a badly socketed soil pipe, or
r derangement in the mechanical contrivances designed to
p out the sewer gas which is always trying to force its way
may destroy human life just as effectually as poison or
knife—and this is why I have persistently supported
mbers' Registration in and out of Parliament, being con-
ced as I am, that without establishing a monopoly, or doing
real harm to any vested interest, the establishment of a
ned curriculum, followed by registration and examination,
raise the status and character of the workman, and by
easing his sense of responsibility and his interest in his
k, will not only confer benefits on him, but also on those
whom he is employed.

he next point I wish to refer to is one of considerable
rest. It is the curious way in which when we have
lished one set of diseases, another band of successors some-
s spring up Hydra-headed to plague poor humanity. I suppose
ust be so, for we poor mortals have not put on immortality
must shuffle off our mortal coils in some swift or lingering
, and if we are prevented from dying of one disease we
t of sad necessity die of another, and diminution of some
er death-rate involves increase of some other. We have
ped out typhus under its various names of gaol fever, or black
h, or plague, although I am not sure whether the recent
emic at Belmullet, in Ireland, is the old-fashioned spotted
ilence about which Stokes and Graves used to write, or
ther it is relapsing fever, that gaunt spectre which follows
e wake of misery and famine.

nteric fever has remained pretty stationary during the last
years, but a drop of from 309 in 1876 to 175 in 1895 does
it to our sanitary administration, and phthisis has gone down
26,443 in 1876 to 22,775 in 1894.

mall-pox has taken a satisfactory dip downward from 2,405
376 to 33 in 1895. Measles, Scarlet Fever, and Whooping
gh have killed fewer than formerly, but per contra
theria has largely increased, and the reason of that no
t is, as Sir R. Thorne Thorne says in a most interesting
te communication I have received from him, "to the ever-
ing facilities for personal infection and other similar points
followed on the success in herding our child population
elementary schools at the very age at which they are most
ptible to this disease."

her diseases have also increased, and the point I wish to
s is this, that they are mostly diseases connected with the
ous system, and that Crichton Browne was probably right

in his opinion that not merely the nervous temperan
the neurotic diathesis is on the increase among us.]
with, it is a mournful but I fear an undoubted fact, th
people go mad than formerly. I have not by me any
to prove this beyond the report of the Registrar-Ger
1895, but there I find under the heading of insanity, anc
paralysis a disease which was seldom or ever heard of in
years, 3,620 deaths in 1895 against 933 in 1876.

Angina pectoris, a typically neurotic disorder, has i
within the same period from 397 to 696, valvular disea
heart, which has some practical sympathy with the
diathesis, has gone up from 274 to 10,072, whilst
disease, the frequent causation of which by sudden
shock has been demonstrated by Clifford Albutt, s
alarming rate of increase from 4,100 to 8,351.

Cancer, to which in absence of any better explar
must ascribe a nervous origin, has nearly doubled sin
whilst diabetes reached its highest point in 1895, acc
for 2,265 deaths over 910 in 1876, and most of us kn
too well the firm grip taken by influenza on the
constitution, and the way in which in more recent year
attacked the nervous system, and damaged both w
strong points, with a zeal and discrimination to
permanent in its effects.

There seems no doubt therefore about the fact that
now in the midst of a neurotic age, and the next
interrogation is, why? The answer to this, if there
would require a course of lectures, rather than one addr
all I can do is to indicate one or two suggestive consid
which perhaps some of my successors, or some of you
before me, may work up.

About the time I began my medical studies, a
controversy raged in Edinburgh concerning the treat
acute inflammation, one side affirming that there h
a change in the type of disease, whilst the others
and to my mind more successfully, that the change ha
taken place in the constitution of the patient. At all
the bleedings and blisterings and purgings amid a succ
which the Squire Western of former days passed pe
out of existence, have given place to careful nurs
feeding, and moderate stimulation, and results which
the medical man to rank along with the sanitarian
prolonger of human life.

But why this change of constitution? Some ascribe i
stress and push, the sturm and drang of this competi
when berths are few and men are many, and when the

subsistence trenches too closely on the means of support. his sort of reason has always seemed to me both feeble and isatisfactory as well as non-convincing, for is it not those who e removed by fortune from the whirling mælstrom of life into iet backwaters, who suffer most from nervous affections? ho is it who have the neuralgias, and the hysterias, and the art failures, which send them to Schott & Neuheim, and the rvous prostrations which attack both sexes alike, and which netimes seem to me to come from blue rather than red blood? t the strenuous workers in the hive, but the drones who, re by chance than design, and from lack of opportunity her than deliberate idleness, lose the healthy stimulus of upation, and spend their time in that most wearisome of man occupations, trying to kill it. And now I think I have lue. This is also essentially an anæmic age. How many ing girls in any rank of life escape passing through a bloodless ge, which suggests a strike or a lock-out among their red puscles, and a consequent stagnation of those vital processes ich depend on their active functioning? Some one has cribed neuralgia as the cry of starved nerve roots for a lthy blood, and may not modern nerve derangement be due this deficiency of the most vital element of our vital stream.

Let us take another glance at the Registrar General's report l we will see that deaths from anæmia, chlorosis, and leucocyæmia have advanced from 576 in 1876 to 1,883 in 1895, and t with a glance at the cheeks of the rising generation must ivince you that this increase of pallor is only too real.

Then why is it? Ask your medical friends, for on this asion I am only a sanitarian, and put before them these cial points. Has anæmia anything to do with too much at eating, and too little milk and oatmeal, and fruit and etables? Is it connected in any way with over-pressure at ools, or has our old friend tight-lacing anything to do with in other words what is the explanation of the undoubted t? And when you have received the information from your dical adviser, I hope you will come and tell me all about it.

much then for civilisation and its defects. Have I anyng to suggest for the improvement of the human race— lution is still going on, and I have some suggestions to make ards the formation of a Sanitary Utopia, the capital of ich shall be our lamented friend Sir B. Richardson's City of geia, where we should all like to live and move, and have being, if we could get the chance.

And just let me say a word in favour of sexual selection. e Vicar of Wakefield chose his wife sensibly—as she chose wedding dress; on account of her wearing qualities. That is a good working kind of rule. Look upon good healt and a well developed frame as a cardinal esthetic principl before which mere superficial prettiness must hide its diminished head. And then avoid too early marriages. Twenty five is the ideal physiological matrimonial period for women a originally laid down by Mathewes Duncan, and it is satisfactor to note that on the whole the inhabitants of our island sustain their reputation for common sense on this subject. For turning once more to the Registrar General' reports, we find that of 222,787 couples who were married i 1895, the mean ages were 28·42 for men, and 26·16 fo women; and a curious point is that "a slight diminutive i the marriage rate coincided with a rise of four per cent. in th value of British exports, a rise of one per cent. in the value o imports, and a rise of one per cent. in the price of wheat pe quarter." And for the information of enterprising and expectant bachelors and spinsters it is interesting to note that th lowest marriage rates were in Rutlandshire, Middlesex, Cumberland and Surrey, whilst the highest were in South Wales Lancashire, Warwickshire, the East Riding of Yorkshire Nottinghamshire, and London.

There is much to be taught and learnt about the feedin and rearing of children, with that I have nothing to do, bu vaccination is in my province, and I would suggest that the ag should be raised so as to avoid the teething and erupti periods, and that every infant should then receive the undoubted protection afforded by four good marks on its arm, an the operation should preferably be done by a *public* vaccinato whose results are always far better than those of the priva practitioner, whose soft heart and material self interest lea him to succumb more readily to the sentimental protest mothers and mother-in-laws; and before I leave this, let m say, without entering into acutely controversial points, that look forward with great hope to the removal of much of th objection to vaccination by giving at least the option of calf lymph preserved in glycerine, which not only preserves, but even enhances its antidotal power: and time will no doubt place at our disposal other agencies for the prevention and cure of other diseases. Already the genius of Pasteur has saved us in great measure from the horrors of hydrophobia; diphtheria, if attacked early enough, yields readily to its anti-toxin, and science is working vigorously to isolate and attenuate other deadly poisons. And we, who are onlookers, but are one day to participate in the benefits of her skill, must cordially wish her God Speed.

School life is attended with dangers aud difficulties, which,

m to time, are well and practically considered by the Medical
fficers of Schools' Association. The chief of these is the
lling deadening of the processes of child life by the aggrega-
n of pauper children into barrack schools, the pauper taint
ich inevitably hangs about them through life, the way in
ich ophthalmia and ringworm cling to them, and the excellent
ults to be obtained by boarding out and emigration.

For further information I must refer you to the writings of
s. Barnett, and the work of the excellent association of
ich Lord Peel is the head.

Our growing citizen has now grown to man's estate and has
shift for himself. I hope that he has learnt the laws of
lth and the principles of sanitation, and so far as in him lies
takes care that he has good food well cooked, that his house
well drained and ventilated, and that he takes full advantage
the ample water supply now provided in every large town.
hope he does not cease to grumble at the smoke-laden air,
ch he is too often compelled to breathe, and to protest
inst his lungs, clothes, and furniture being made the recep-
le for that wrongly placed matter which we call dirt.

ls the father of a family the question of meat inspection is
great importance, more especially since the labours of the
al Commission have shown that tuberculous meat *may*,
ler favourable conditions, transmit disease. And he should
ss on the authorities the advisability of having *public*
ghter houses where efficient inspection can be carried out
h the smallest expenditure of time and money. And under
inary circumstances of life, it is a great precaution never to
w children to drink anything but boiled milk.

He should be exacting in the matter of light, and should
n face the fading of a drawing-room carpet rather than
ds drawn down and windows closed, until what we Scotch
s call "the room" is about as close and musty as a
's cabin in mid ocean. Remember that the sun's rays
bacilli, but encourage the processes of life, cheering the
nd, and aiding the recovery of the sick, and even its imita-
s are useful, for Sir W. Preece found at the General Post
ce Savings Bank Department, electric light diminished the
absence by two days per head per annum. The difficulties
water-borne sewage will have to be vigorously faced some
, and I agree with Dr. Poore in hoping that the manurial
lth annually squandered and rendered useless by copious
tion and anti-septic admixture may some day be utilised for
good of the earth as effectually on a large scale, as he has
wn it can be on a small. As for the rubbish of the dust-
cremation is the remedy for that, and the prejudice of

[illegible] destructors may be lessened by the success
[illegible] inaugurated by Lord Kelvin in the Ea
[illegible] where the heat from burning refuse was utilis
[illegible] of electric lighting.

[illegible] time had permitted I should like to have traced t
[illegible] from the period of adolescence at twenty-th
[illegible] maturity, when the leaf is fully developed
[illegible] decline sets in at sixty-seven, and the gre
[illegible] and finally bidding him farewell when t
[illegible] grow bare and autumns fading leaf told t
[illegible] Let me give him a word or two
[illegible] If he wishes to live long, he will ha
[illegible] in Norway, and the worst in Ireland, and it
[illegible] because the strongly vitalised and apt
[illegible] pass four score and five years
[illegible] three to one of those among whom th
[illegible] his fellow citizens.

[illegible] is the full enjoyment of it while it las
[illegible]—

[illegible] digestion. You must put yourself under medi
[illegible] and your doctor's attention should be large
[illegible] of uric acid, that pest of advanci
[illegible] gout, and the origin of which see
[illegible] intemperance in the use of red mea
[illegible] coffee and cocoa, which contain, accordin
[illegible] a chemical substance which is speedil
[illegible]

[illegible] of the heart and great vessels, and i
[illegible] moderate in the use of alcoholic drinks
[illegible] the way of catching those entheti
[illegible] with atheroma, we may hop
[illegible] system in a state of integrity unti
[illegible] accidents of course. In the
[illegible] changes are apt to set in, and rigi
[illegible] moderate our pace, and walk
[illegible] friend, Sir Isaac Holden, who
[illegible] and useful life at the age of
[illegible] his dietetic scheme, which
[illegible] salts of lime, as contained
[illegible] according to him, became
[illegible] and led to brittleness and
[illegible] He ate a great deal of fruit
[illegible] and partook most sparingl
[illegible] before his death, when I me
[illegible] perfect bodily vigour, an
[illegible] a man of seventy or seventy-fiv

is death might really be called premature, and illustrating the ll known fact that the old get along all right, as long as the ad is smooth and flat, and they do not trip over obstructions ich would hardly affect a younger man. For I believe it s from the effects of influenza that this remarkable man was noved from among us.

Third and last. Sustain the nervous system in good repair, l this simply means general bodily vigour. Good regular rk is essential to keep people's minds from preying on their lies, and it is interesting to note with Dr. Beard, quoted by hardson, that the average age of five hundred of the greatest n in history, was 64·20, and Madden gives a list of two ndred and forty illustrious hard mental workers who attained n average of sixty-six years.

hen, how long should we live? Professor Owen used to say long as our teeth, but dentists have altered all that. hardson says ninety years, Dr. Farr extends the span to hundred, and Lady Glenesk in her recent article in the th Century," makes our claim on longevity run as far as hundred and twenty years, and the moral of it all is, that hould try to live as long as we can and as well as we can, teach our children to do the same. Saying with old Adam: ough I look old, yet I am strong and lusty, for in my h I never did apply hot and rebellious liquors in my blood, did with unbashful forehead woo the means of weakness debility. Therefore my age is as a lusty winter: Frosty kindly."

inally, a word on the housing question.

hat is urgently needed is, firstly, drastic radical legislation hich local bodies may be able to acquire land compulsorily aying full compensation for building workmen's houses, and quick and cheap railway travelling rendering it possible ity workmen to live in the surrounding country. As Dr. ail puts it in a letter to me: "This is a sanitary measure h may have a great future before it. Houses built in the try for such a purpose would not have the defects of damp disrepair, which belong to the dwellings in a decaying ultural village. Such dwellings would have the advantage of town and country, the *natural* advantages of fresh air ural surroundings, and the *artificial* advantages of houses according to city requirements, and with shorter hours of r the artizan will have plenty of time to travel backwards forwards." Light railways will do much to help in this tion, and it does not require me to sing the praises of the nigh universal wheel.

t we must now leave Utopia and come back to this work- world, which, after all, is not such a bad place to live in

[illegible] As I have already shown, e
[illegible] to ourselves and to oth
[illegible] and then we pass into the ha
[illegible] good work, who general
[illegible] and whose beneficial operat
[illegible]

[illegible] the House of Commons, an
[illegible] of saying that I have a very poo
[illegible] assembly in its dealings with pu
[illegible] that to which I belong is,
[illegible] suspicion of scientific meth
[illegible] is established in certain radic
[illegible] of personal liberty and distrust
[illegible] doctors sway a kind of plausible
[illegible] irresistible in its paralysing effects
[illegible] a member lately remarked with refres
[illegible] were considering the Public Health Se
[illegible] the doctors on both sides of the house a
[illegible] me that something is wrong and I will
[illegible] Under such conditions the priv
[illegible] nothing, but he may be still usefull
[illegible] public opinion in and outside the H
[illegible] problems reach the acute stage and are t
[illegible] protection, and, as one last word, let n
[illegible] I have already publicly expressed in
[illegible] Health, a department of the State
[illegible] consolidate into one harmonious whole tl
[illegible] sanitary legislation which entangle and
[illegible] of our great Parliamentary offices,
[illegible] all health questions and furnish a
[illegible] which would enable to see at a glance wl
[illegible] and admission to which would be a
[illegible] to the best scientific talent of tl
[illegible] and gentlemen, I have at last com
[illegible] We have rambled over a good bit
[illegible] are out of breath, and w
[illegible] this Congress may be infe
[illegible] that much practical benefit
[illegible] use of the imag
[illegible] with the matter of f
[illegible] and between the two,
[illegible] its diminished he
[illegible] we christians do
[illegible] of promise, yet it will
[illegible] in our journeyings tl
[illegible] shoes and garmen
[illegible] worn or impaired."

SECTION I.

NITARY SCIENCE & PREVENTIVE MEDICINE.

INTRODUCTION

BY T. PRIDGIN TEALE, M.A., M.B.(Oxon.),
F.R.C.S., F.R.S.

PRESIDENT OF THE SECTION.

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opening this Section without any elaborate or formal ad-
s I may be departing from custom, and even from what is
ected of its President.

he fact, however, is that what I might have to say on the
ject of Sanitary Science, has either been said by myself
ady on public occasions, or has been carried far beyond my
k as an amateur by others, by men who are devoting their
le time and energies to one of the most weighty subjects
ch can occupy the attention of those whose duty it is to look
r the weal of the commonwealth of this empire.

t is six-and-twenty years since there was in Leeds a general
lic discussion of Sanitary Science, in its broadest sense,
n in the section of "Health," presided over by Mr. Godwin,
editor of *The Builder*, the Social Science Congress had
ered together the comparatively small band of sanitary
eers. These men were urging upon the attention of the
try, not too ready to listen, the critical importance of
tary work, and the dangerous position into which we had
ed. Such were Rawlinson, Edwin Chadwick, Acland,
us and others.

is interesting, in reading the papers and discussions on
occasion, to observe how many points then urged, almost
open to doubt, or at any rate as needing strong arguments
mpel acceptance, now "go without saying"; how fore-
as to the possibility of diminished death-rate under
oved sanitary conditions have been fulfilled, and how the
c conscience has been awakened to the necessity of
ing improved conditions of living, not only in the great

[illegible] villages and scattered hamlets. What
[illegible] is now, as far as legislative
[illegible] being reduced to order: and
[illegible] of such order reaching ev
[illegible]

[illegible] marks advance. The cor
[illegible] Social Science Association
[illegible] the British Medical Associati
[illegible] younger society adopts the sign
[illegible] Medicine," coupled with "Sanita
[illegible] itself more and more
[illegible] the origins of disease with a vi
[illegible] no longer content merely to rep
[illegible] of disease which ought to have been prevent
[illegible] is the hand-maid of medicine
[illegible] the mechanism by which evils c
[illegible] be made more secure.

[illegible] the immense organisatian of
[illegible] of the kingdom, in which we
[illegible] sanitary authorities, medical officers of hea
[illegible] nearly every practising med
[illegible] interesting to look back but eight
[illegible] "Dangers to Health"
[illegible] of the state of medi
[illegible] connection between defective ho
[illegible] from the dedication "
[illegible] have studied, investigate
[illegible] arrangements of their own houses.
[illegible] a small minority may, befo
[illegible] a large majority of the medic
[illegible] Kingdom." This is dated January 1s

[illegible] published two years later, a ne
[illegible] it seemed to me that ther
[illegible] state of medical kdowledge
[illegible] "Dedicated to th
[illegible] in the matter of health
[illegible] their duty, not only t
[illegible] remedy, but to prevent—
[illegible] at the service of presen
[illegible] evil report and good repor
[illegible] spend their energies i
[illegible] that flesh is heir to." Agai
[illegible] "many of my friend
[illegible] with pride and evider
[illegible] sanitary discoveries, feeling that they a

conferring a welcome favour by telling me of some 'new fault' for my book."

In the same edition (1881) there is the following amongst the sanitary maxims, which may be taken I hope as marking a great contrast with the state of public opinion at the present day: "No. 3. As a rule the soundness of the sanitary arrangements of a house is taken for granted and never questioned until 'drain-begotten' illness has broken out. In other words we employ illness and death as our drain detectives."

Much remains to be done. "Preventive medicine," as a young science, has we trust the vigour and enthusiasm of youth, and during the last thirty years has achieved much, especially in winning public opinion to its side. Let us therefore take heart.

SECTION II.

ENGINEERING AND ARCHITECTURE.

ADDRESS

By LEWIS ANGELL, M.Inst.C.E., F.R.I.B.A.,
Fellow, King's Coll., Lond.

PRESIDENT OF THE SECTION.

Engineering and Architecture are cognate subjects, coverin
large field of thought, practice, history, and of potentiality, wh
exercise large influences in the material prosperity, comfort, ε
civilization of the world. It is a long cry from the aborigi
canoe to the Atlantic liner, or from cave dwellings to a Quee
palace. The evolution of architecture and engineering has b
unequal; architecture has developed through thousands of ye
of Assyrian, Egyptian, Roman, Grecian, and of Mediæval hist
with which its progress, as an art, practically stopped. Arc
tecture now lives in and repeats the past. Early civilizati
devoting itself to art, lacked appreciation of the laws of nat
and the faculty of invention. Engineering is a new and phe
menal development of our own time. Every age has b
marked with its own characteristics, whether it was Literat
Poetry, Art, Sculpture, Painting; or by great conquests, p
tical and religious revolutions, moral and social upheavals.
different action and by different influences all, in their own w
have made for civilisation and culture.

The most striking feature of the Victorian Era has been
development of the practical and the useful. The predominati
feature of the engineering of the Ancients—Bridges, Aqueduc
Pyramids—was massiveness, but through the intermediate ag
excepting in now obsolete fortifications, scientific engineeri
made no advance. It was not until the reign of Victoria, a
almost identically with Her Majesty's accession, that the pr
fession of the Civil Engineer came into existence, a professi
which England was the origin and the cradle; no long
the piling up of mass but by the application of t

finements of science, producing structures of lightness and ability from the manipulation of Iron and Steel; by the wer of steam applied to complicated mechanism, bringing gether the peoples of the whole world; by grasping the ghtning flash so as to "put a girdle round about the rth in 40 minutes," enabling Her Majesty to speak her acious Message to her subjects, almost simultaneously roughout the Globe, before starting on her way to St. Paul's r her ever memorable thanksgiving on the completion of a ty years' reign which has witnessed the greatest development the various departments of science, of engineering, of inven- ns, and of general progress which the world has ever seen.

rty years ago, and much later, people gazed with awe at the w developments, by leaps and bounds, of the marvels of science, rvels with which our children have become so familiar as to gard as a matter of course. We have arrived at a condi- n of *nil admirari* and become as Gods, "directing the great rces of power in nature for the use and convenience of man."

Engineering and architecture represent the constructive e of sanitary science. One branch of engineering, upon ich millions are annually expended, is directed to the destruc- n of human life. The Engineer has revolutionized war. e "wooden walls" and canvas, the glory of our forefathers, gone. We no longer rely on "hearts of oak," the scientist s pushed aside the "man at arms." The "sinews of war" now of iron and steel. The primitive "brown Bess" developed into a costly and complex piece of machinery rked by electricity behind an ambush of iron. No longer is contest "hand to hand," but mile to mile, a contest of ence and engineering.

The works and objects of the sanitary engineer are not the destruction but the preservation of life, and the pro- tion of health and comfort. If the millions expended in r had been devoted to preserving life, what a different ult would history have had to record. It is stated as a tistical fact that more lives have been lost by plagues, tilence and preventable disease, than by all the wars in the rld's history. We remember the great mortality in the mean army, greater than any on record; out of 33,000 glish troops 11,000 died of disease in three months. A nitary Commission was sent out, consisting of two medical n and a civil engineer (Sir Robert Rawlinson), who tell us t at the end of the year the entire army in the field before bastopol was in better health than it had ever been at home. r French allies had no Sanitary Commission, and it was orted they had more than 40,000 men down, principally in fever. Since those days sanitary work has permanent reduced the death-rate in both the British and the Indi armies.

This year marks the Twenty-first Anniversary of the founc tion of The Sanitary Institute. The time is not very rem when very much that was new could be said of its aims and objects, but the science and the laws of sanitation are n well known and established, and the past addresses of so ma able predecessors in this chair, as also the various valua papers and discussions of the Congresses, cover the wh ground; therefore, anything which I may say that is tr will not be new, and what is new may not be true. All c can hope is to drive home old-established truths by repeati line upon line and precept upon precept. The object of th Congresses is the diffusion of sanitary knowledge in all parts the country, and to excite an interest in our work.

By Sanitary Science is understood the application of th general laws and conditions of health affected by the action physical agents and local surroundings within such control will enable us to promote comfort, prevent disease, and prolo life. It is the province of the Medical Officer to disco and trace defects, and of the Engineer and the Architect find and apply the remedy.

Drains and sewage are not inviting subjects, neither disease and death. To those of us who have become vetera the history of sanitation is as a thrice told tale; but to recruits, who have but little conception of the difficulties a obstructions of early sanitary reformers, a short resumé m not be uninteresting, and will help to keep knowledge alive.

In the ages of mythology, plagues and pestilences we attributed to the Gods. There are some now who ascri ancient plagues and modern epidemics to occult natural caus which exhaust themselves and reappear independently hygienic efforts. Others regard them as the punitive acts Providence rather than warnings that nature's laws have be infringed. "God helps those who help themselves." W know how the efforts of Howard, Jenner, and other histor names have extinguished jail fever, and mitigated scurvy a small-pox.

Among Members of The Sanitary Institute it is only goi over old ground, flogging a dead horse, to refer to the recurri plagues and pestilences of the middle ages. The "Bla

Death" of the 14th century is estimated to have carried off from ne-quarter to one-third the population of Europe. There was lso the "Sweating Sickness" of the 15th and 16th centuries. These have been "stamped out," and, as we hope, also practically ie cholera. Two hundred years ago the mortality of London as 80 per thousand; last week it was 16·3. Every nation of hich we have historic record has paid the penalty of the eglect of sanitation, as exemplified by the plagues of Rome, of reece, and, even at the present day, of India and the sanitary nations of the East—plagues which have disappeared nong the more highly civilised nations of the West.

Notwithstanding the repeated warnings given by plague, stilence, and disease, the Legislature was slow to recognise e importance of establishing proper measures for the preservation of the public health. The habits of modern civilization ave caused people to herd together in their thousands, their undreds of thousands, and in millions. The result of the great gregations of populations has been the pollution of the soil on hich they live, the air they breathe, and the water they drink. hatever the variations in climate, the chemical constitution of e atmosphere is the same in all places. "God made the untry, but man made the town," is a trite saying. Nature's ws are perfect, the natural instincts of man, in common th the brute creation, teach him to seek suitable food, are endowed with senses to avoid what is injurious; t in towns, the air we breathe and the water we drink are yond the power of individual selection. Sanitary science aches that as communities we cannot, with impunity, pollute ose essentials of health, air and water, so bountifully supplied nature.

Although the Sanitary branch of engineering is a modern bject, we find very early records relating to sewers. Commissioners of Sewers have existed since the reign of Henry VI. t their powers, although great, referred only to surface inage and sea walls.

Several derivations of the term "sewer" have been suggested: cording to one it is a corruption of the word "issue" or "issuer," other derives it from "sea weir" from the fact that sewers charged on the shores of seas and rivers. Within my own collection sewers were called "Shores" by the workmen. It more probably a corruption of the old French word "*esuier*," t, whatever its derivation, the word "sewer" applied originally ly to navigable water-ways in which the tide ebbed and flowed. the time of James I. the term was extended to gutters, eams, and watercourses. It is only in recent times that the term began to convey its present unsavoury meaning. So recently as 1815 it was penal to discharge house drainage, or other offensive matters, into sewers. It was laid down by Lord Chief Justice Holt, "That every man should keep his dirt to himself."

At first houses were drained into open gutters, or kennels running into the middle of the street—an arrangement which may be still seen in some continental towns.

Houses having basements were provided with cesspits to catch the drainage. When their contents became too offensive for retention in the house, they were pumped up into the street gutter. In the "Life of the Lord Keeper Guildford," there is a curious account of the drainage of Chancery Lane in the time of Charles the Second. It is related how Lord Keeper Guildford put the law in force:—

"His Lordship procured to be done another good work, which exceedingly improved all the dwellings in Chancery Lane, from Jackanapes Alley down to Fleet Street. He found in his house a small well in the cellar, into which all the draining of the house was received, and when it was full a pump went to work to clear it into the open kennel in the street. But during this pumping the stench was intolerable, and offended not only his Lordship, but all the houses in the street; and also passengers that went to and fro in it. And other houses there, which had any cellars, were obnoxious to the same inconveniences. His Lordship proposed to them to join in the charge of making a drain or sewer all along the street, deep enough to discharge into the grand common sewer in Fleet Street. The inhabitants would not join, alleging danger to their houses, and other frivolous matters, and thereupon his Lordship obtained a decree by virtue of which it was done, whether they would or no, and the charge paid by a contribution levied upon them; and then they thanked his Lordship for so singular a good done them." I fear gratitude is not so spontaneous in the present day, for only a few days ago the following complaint appeared in a local paper of a large Borough:—"Our Municipal Authorities are worrying a small class of property owners to remove stack pipes, divert drains, and do the hundred and one things which, under the plea of sanitation, make a landlord's life a nightmare." It is obvious, therefore, that the insanitary spirit is not yet laid.

Historically it is usual to quote Moses as the first practical sanitarian. The first "Destructor" we read of was the Gehenna, or Hell-fire, outside Jerusalem, where the refuse of the city was burnt; Destructors of a different type may be seen outside eeds. There are many rival Destructors known to engineers, y only remark will be that a very large proportion of the efuse carted from houses at a great cost had better be burnt ehind the kitchen fire than harboured in dust bins. Our istory begins with the present reign, with the advent of hadwick, Rawlinson, Southwood Smith, Simon, Farr, ichardson, Carpenter, and other pioneers who, in England, first rmulated the principles of sanitary science as applied to wns and dwellings.

Although England originated sanitary work, free and demo-atic America, having less sentimental notions respecting the berty of the subject, has in many ways been in advance of s in the control of such matters. In New York and other tates, that great offender, the plumber, has for a long time en placed under official inspection, other State Boards of ealth, especially of Massachusetts, have been conspicuous by eir action in sanitary work.

The early Acts were, for the most part, of a tentative and rmissive character. In 1873 Mr. Justice Blackburn declared at the various sanitary Acts were the greatest muddle out, d in 1875 the Local Government Consolidating Act was ssed. The first practical attempt at sanitary legislation, the owns Improvement Act, having passed in 1847 we may oclaim this year of 1897 to be a sanitary jubilee. The olera of 1831 had prepared the way, as the outbreak of olera at Hamburg five years ago gave a stimulus to sanitary ork in Germany. A Nuisances Removal Act had been passed 1845 and in 1848 the "General Board of Health" was tablished. About the same time the "Metropolitan Com-ssioners of Sewers" displaced various smaller bodies and, in ondon alone, some 30,000 cesspools were abolished. A Royal ommission reported that in Manchester and Salford if the uses were removed the site would be marked by 60,000 sspools.

Having compelled drainage into sewers the common law inter-ned and new Pollution Acts were passed. Injunctions innume-ble followed, some of which are still proceeding, and enormous nounts have been expended in litigation. The Local Board Hitchin was so frightened as to resign *en masse*, and for ny years the town was without a Board.

In avoiding Scylla, Charybdis was encountered. It was first ade compulsory to discharge sewage into the sewers and then it came penal to discharge sewers into rivers. The pollution d been diverted from the land to the water, and that "silent ghway" the Thames, was converted into a foul, filthy, reeking, ain sewer which fortunately poisoned our Legislators in their

Parliament House, in their fright they hurriedly established th Metropolitan Board of Works with power to intercept sewag from the Thames and discharge it a few miles below Londor More recently the London County Council have adopted measures of comparative purification, transporting the sludge wel out to sea by a fleet of steamers, so that offence is avoided an the Thames relatively purified, results which have been accomplished by engineering works the like of which, either in desig or magnitude, the ancients never produced. Other great town of the country have had a more or less similar experience.

Upon the general engineering principles of town drainage, th subdivision and interception of areas, the forms, sizes, an gradients of sewers, engineers are generally agreed. The Englis hydraulic or water carriage system has been accepted as t cheapest, most efficient and least objectionable, it is universal extending and will ultimately be adopted by every town in t civilized world. Continental Hotels pay us the compliment advertising that their Sanitary arrangements are on the Engli system. Every well-to-do household in the North of Engla has adopted the Southern Water-closet, its decency and cleanliness is equally the right of the cottager. Sewers necessary in every town to get rid of its surface drainage. To washings, even where excreta is excluded, is highly polluting any stream, therefore, in any case, there is very little advanta in excluding the sewage. Decency condemns the midd and pail systems and their manipulation as a filthy abominatio The Rivers Pollution Commissioners have shown that the is only one-fifth difference between the sewage of a wate closeted town and that of a town not water-closeted. It is al found that in kitchen slops there is a higher putrefacti decomposition than in the discharges from water-closets.

The history of that "Slough of despond," sewage, revea some very erratic procedures.

More that 30 years ago we were taught, with all th authority of Royal Commissions based upon elaborate evidenc and experiments, that in sewage we had a "mine of wealth, which, if applied to the land, would feed the country, therefore to waste it was a crime. Sewage farms have had their day. Some are still doing their work, but the "wealth" has not been realized, nor have our food imports been reduced. The chemists, the patentees, and the stock-jobbers have also had their day, and failed.

The question has just now taken a new departure in the direction of the very interesting biological aspect to which

ttention is so actively directed, especially by the results of
ecent investigations of American engineers and chemists, who
ave studied our early works and avoided our failures.
We appear to be harking back to first principles, to the en-
ineer's tanks and the resurrection of the microbe, killed by
e chemist with his patents and re-agents. May we
anonize its restoration this year with the title of the Jubilee
icrobe? Microbes appear—like influences in the moral
orld—to work for good and for evil. There are good and bad
icrobes, and probabilities indicate that the good microbe will
evail, and that the purification of sewage will be effected by
ing organisms. The strides which the new study of bacteri-
ogy has made bids fair to disestablish sewage farms, chemicals,
tent processes, sludge presses, and the like, and effect the
composition and nitrification by processes of filtration, oxida-
n, and biological action in septic or bacterial tanks, which
matter for the sectional papers and discussions.

The subject of sewage suggests that of sewer air and ven-
ation, a matter which has been much discussed, written
out, and experimented on, but in which very little advance
s been made. The ventilation of sewers is a recognised
ficulty, as also a matter of much sentiment. The general
inion and practice of municipal engineers is in favour of free
d open street surface ventilation. Although the system
y be denounced by many as primitive and unscientific,
ither science nor experience has yet shown a better method.
wer smells may be detected occasionally over surface ven-
ting grates, but at the worst only a very dilute gas is
en off as compared with the pent up air emitted through
connections with sewers which are not freely ventilated.
free air all trace of sewer gas is lost at a very short
tance. Open street ventilators secure the ready escape of
; the abundant admission of fresh air to dilute the sewer
; produce a thorough aeration of the sewers, and by
dation prevent putrefaction. It is infinitely better that
ers should ventilate in the middle of the street than
meate the centre of our dwellings. It is told that when
plaint was made to Sir Robert Rawlinson that two street
tilators emitted effluvia, he advised that a third should be
ced between. In this city of Leeds some years ago there
a wholesale opening and untrapping of ventilators and
lies, and, as I was informed by your Borough Engineer
e ten years ago, with advantage.
The suggestions of furnace extracting shafts and small pipe
tilators extending to the house tops is very plausible, but

carefully observed experiments have shown that at short distances the effect of furnaces is inappreciable. The late Sir Joseph Bazalgette and the late Mr. Haywood, Engineers to the Metropolitan Board of Works and to the City Commission of Sewers, carried out a series of observations with a furnace in the Westminster Clock Tower and reported adversely upon its effect. I have myself made observations of the effect of the connection of a large main sewer with the chimney shaft of an engine house without any satisfactory result. An upcast and downcast system of ventilation is often suggested on analogy with the ventilation of mines. No such analogy exists, the conditions being entirely different. The ramifications of a system of main and branch sewers and house drains—the hundreds of inlets and outlets—disturb the essential conditions of mine ventilation. It would require hundreds of furnaces and shafts, continuously in action, to maintain such induced currents as would draw the air out of the sewers, with the probable result of drawing the water out of the house traps also. Ventilating pipes, to be of any use, should be large, observations made on small pipes, carried up house walls, with their bends and friction, do not show any efficient extraction. The specific gravity of sewer gases does not induce a natural rise up such shafts, while their existence near windows and chimneys is much more dangerous than in the open street. Considering the enormous number of surface ventilators which exist, the offence is very small and the complaints relatively few and far between. There are doubtless special cases which may require to be specially dealt with, such as the dead ends of sewers. Dead ends should be avoided, and in all practical cases the sewers made to intercommunicate, so that the currents of air could be freely distributed. In London, and all towns excepting Bristol, which has been much discussed, we freely ventilate sewers on the surface. Charcoal baskets and other devices have not given any assistance in the solution of the question. Charcoal at the best obstructs free ventilation, and unless dry, which its situation precludes, is worse than useless.

We are told by chemists of eminence that the results of their investigations in the London sewers shew that they found sewer air much better than they expected, that the micro-organisms in sewer air are highly respectable and related to those floating at the same time in the outside air of the street, but actually fewer in the sewer than in the street, and less than in any house investigated, in fact that sewer air "was in a very much better condition" than the air in schools. Less favourable results followed on the act of "splashing," from the whole of which the unlearned would infer that a sewer is the nost desirable residence—providing you don't splash. These re, however, debateable matters for the Sections to discuss. f the character of sewage has been calumniated the exaggeration s useful, for however respectable sewer microbes may be, no ne would suggest them as desirable neighbours.

The principles and details affecting house sanitation are now o well known and understood that it would appear there is but ttle more to learn; yet how short a time since every sani-ary principle was most flagrantly contravened. Our immediate refathers even taxed the light of Heaven. I remember when child watching the bricking up of windows in order to escape he "window tax," regardless of the Italian proverb to the fect "Where the sun does not enter the doctor does." Quite cently all the arrangements of domestic sanitary work were rongly constructed and *in*sanitary. The details of the cisterns, he closets, the baths, the sinks, the traps, the overflows and he drains were all wrong; pipes and fittings which should be en to inspection were hidden and inaccessible. Not only was th retained in our houses, but services of sewer gas laid on them.

The cardinal conditions of health pure air, pure water, and polluted earth, which, with the accessories of wholesome food, oper clothing and suitable housing—the necessaries of life—mprise the whole gospel of sanitation, its exponents being the nscientious builder and the intelligent housewife. In our own bitations we have individual control, therein should we be reful that all living rooms have ample means of ventilation; at there are no connections between the dietetic water supply d the drains, no connections with the sewer excepting for the scharge of sewage, that the drains are trapped outside and ntilated by a free current of air, that all discharges from sterns, baths and sinks are into the open air. These are nitary axioms which have been so often repeated as to almost ed apology for their quotation before the Members of the nitary Institute, but they do not yet "go without saying," ey are "more honoured in the breach than the observance," d if such congresses are to have any effect it is by the sistence of such axioms upon the larger audience outside our lls to induce the adoption of the simple precautions which otect the inmates of workhouses, asylums, reformatories, and ils.

The defects enumerated were general in all houses, and main in many. Architects did not trouble about such un-æsthetic matters, they were left to "rule of thumb" men. The architect left it to the builder, the builder to the foreman, the foremen to the bricklayer or plumber, and the bricklayer to the labourer, until, sanitarily, we had a veritable house that "Jerry" built, perhaps artistically decorated and pleasing to the eye, but rotten at the core. Death is no respecter of persons but a great respecter of circumstances. Prince Albert and the Prince of Wales were among the great who suffered from insanitary surroundings. How many among the various grades of lesser degree? The architect is very dependent on the workmen and it is of the greatest importance that clerks of works and foremen who have the actual supervision of work should have technical and practical sanitary knowledge, especially in plumbing and drainage, which is very far from the case with the older generation of building artizans. The younger workmen are learning to appreciate these points and the carpenters and the plumbers' companies of the city of London, as also The Sanitary Institute, are encouraging and assisting all who aspire to correct knowledge in these matters.

The subject of "combined back drainage" has recently very much occupied the attention of Sanitary Authorities. The system known as combined back drainage is the connection of terraces or groups of houses with lines of pipe drainage at the rear, so as to avoid carrying drains under houses. The arrangement has been in practice since the passing of the Public Health Act, 1848, an arrangement advised by the General Board of Health, and subsequently recognised and re-advised by the Local Government Board under the Public Health Act, 1875, and emphasised in the "Model By-Laws" issued by the Board in 1877. The practice was that private owners who laid their own drains on their own premises, generally along back yards or gardens, were responsible for the maintenance of such privately constructed drains, the Local Authorities serving notice upon owners, when necessary, to repair defects. Such was the procedure for more than forty years after the passing of the Public Health Act of 1848, the intention of the framers of the Act being obvious, and until nearly four years ago (when acute owners and clever lawyers found a way of driving the proverbial "coach-and-four" through the Act) no other interpretation had been suggested, but in a certain case, *Travis v. Uttley*, the Court of Queen's Bench gave a new interpretation of the terms "drain" and "sewer," and it was laid down that "drain" means a drain of and used for the drainage of one building only or premises within the same curtilage; and that "sewer" includes sewers and drains of every description, except drains to which the definition of "drain" applies.

We cannot question the technical accuracy of the Courts, but the effect is that most drains—although laid on private property and frequently passing under a house—have now become sewers vested in the Local Authority, who are bound to maintain them in repair; the result is that miles of drains laid in private premises, however badly constructed originally or tampered with subsequently, are now "public sewers," imposing very great cost on every Local Authority, with a orresponding relief to the property owners. The Lord Chief Justice may well have said that the condition of the sewer aws is a "scandal." Several recent attempts have been made o put the law on a more equitable basis, but the Bills have een invariably blocked in the interests of property owners.

There is however a Nemesis in all this. The Local Authorities f the past would not provide the small staff of Inspectors ecessary for the proper supervision of buildings and house rainage; unprincipled owners and "jerry" builders could, n their own premises, do very much as they pleased. The ocal Authorities have now to provide not only a large staff discover the defects of the past but, at great cost, to remedy e bad work which could have been prevented by proper superision. The authorities cannot, under the present interpretation f the law, escape responsibility for the past, but they can lessen eir future responsibility by requiring owners to lay a separate rain to every house which, in most instances, would be laid der the house, and under the definition of the Courts, be a ivate "drain," maintainable by the owner, although such a stem would be much more costly to owners and contrary to e suggestions of the Local Government Board who, however, ve not responded to the appeals of the Local Authorities for sistance or advice. In the opinion of many Sanitarians an itiative and active Ministry of Health is required. A former esident of the Local Government Board, Sir Charles Dilke, ter vacating office described the Board as a "Phantom Board, hich was never intended to meet, and which never had met om the day of its creation (1873) to the present time (1884)." is believed that the statement equally applies in 1897.

The Housing of the Working Classes is a prominent feature Sanitation. Whether this should be accomplished by "flats," by "workmen's trains," is a matter for serious consideration. ach good has been effected in the Metropolis by the clearance unhealthy slums, and the substituted piles of tenements are onsiderable improvement; but it is very questionable whether it is desirable to concentrate the working population or limited a space with only street gutters for the childr play-grounds. With the facilities now given by the very ch workmen's trains on the numerous railways, and trams, especi with an eight hours working day, it would be infinitely bette distribute the population. Queen Elizabeth enjoined that building within three miles of London should be divided tenements where families might congregate. The small h and garden is both healthier and more humanising in influences, especially for children, than barrack-like life in f and much more in harmony with the instincts of the Bri workman who should be able to feel that "an Englishm house is his Castle."

The requirements of the Model By-Laws of an open sp relatively small though it be, at the rear of houses an specified width of roadway in front precludes the repetitio the old courts, alleys, slums and rookeries, as also the objectionable back to back houses, which unfortunately conti to exist in some towns which could be named. The adop of these or similar By-Laws, however, is not obligatory, where they are adopted there is danger of the air space be subsequently covered either without authority, or even, as frequently occurs, with the complaisance of the local autho whereby the original object, sanitation, is frustrated. Her again, comes in the legal "interpretation" difficulty. I often contended that an *addition* to an existing building is a "new" building, or at least it is a matter for a court of to determine. I have known many open spaces, already small, to be covered or curtailed under this contention. Ag the air space By-Law does not apply to existing dwelli unless the By-Law was in force at the time of the origi erection. Sanitation demands that in no cases should reserved open space be covered, whether the buildings be or new, and that in all cases the adoption of such By-La adapted to local conditions, should be obligatory.

The great Fire did much for London. Paris under the Em was largely reconstructed. The Emperor, the Prefect, and Engineer constituted a triumvirate which converted Paris int city of splendour. Sanitarians would, perhaps, welcome a tri virate of the Medical Officer, the Inspector, and the Engin but there is a prejudice against triumvirates, London pre vestrydom. Autocracy, however wise and benevolent, repugnant to English instincts. Local Government is a gr principle—in theory—but the procedures of some of governors, as reported in local papers—the "personaliti "disgraceful scenes," "scandals," "rowdyism," not to mention occasionally a "free fight," lead cynics to inquire whether, Local Government is, after all, in practice, a fraud? There s no reason why it should be so if representative men of ntelligence, business capacity, and disinterested motives, se- ected from and by all classes of the people, constituted the governing body. Unfortunately, excepting in our great cities, ocal affairs are not only too frequently avoided by those most itted to take part therein, but a very large portion of the opulation take no interest whatever in matters affecting their elfare, as evidenced by the scanty polling at local elections, ut when an epidemic scare occurs, people who at other times re utterly careless of their local institutions or representation, reak out in hysterical denunciations of local management. n the hands of ignorant and interested persons Local Government may degenerate into littleness, for, as the Royal Sanitary ommission said: "No code of laws, however complete in theory, pon a matter of such importance and complexity as the health the community, can be expected to attain its object, unless en of superior education and intelligence throughout the untry feel it their duty to come forward and take part in s working."

The matter of water supply is largely occupying the con- ideration of some of our large towns, especially the metropolis which some 200 million gallons are used daily. It is timated that upon an average of 32 inches of annual rainll, 27 billion gallons fall over the area of England and ales, or after deducting percolation and evaporation, sufficient r a population 25 times greater than the present. The eat difficulty arises, as in most sanitary questions, from the eat aggregations of populations. The original schemes and lection of the sources of supply did not contemplate such ormous extensions, the additions which from time to time have en made to meet the growing demands complicate rather than sist. The enormous and reckless waste of water is a serious tter. Experience has shewn that about 15 gallons per head r day of the population is generally sufficient for all purposes of town of which only about one-eighth is necessary for dietetic rposes in which purity is essential; the great bulk of the filtered d presumably pure water is used for street watering, drain and wer flushing, fire extinction, yard and carriage washings, &c., t requiring any degree of purification.* If we were to com-

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[*] During the great typhoid outbreak at Maidstone, due to the contamina- n of the water supply, Sept., 1897, it became necessary to cut off the

mence *de novo*, as with the city of Hygeia, a duplicate service would probably be provided which, by the reduction of the quantity filtered, would greatly simplify the water question. It would, of course, require a dual system and special arrangements of taps, mistakes could be avoided by special form or shapes of the taps, no more special care or intelligence would be necessary than for the hundred and one other details of our daily actions. Of course the foregoing observations do not apply to such towns as Liverpool, Birmingham and Glasgow, suppliable by gravitation from the distant natural or artificial reservoirs. Rivers are the natural drainage of the lands within their watershed, and when the catchment basin is either populated or highly cultivated, the rivers, under the most favourable circumstances, must inevitably be polluted more or less by decomposing animal and vegetable products from manured lands, surface washings, the discharges from towns, factories and navigation. I do not propose to enlarge on the general question, competent expert engineers and chemists having the matter well in hand.

Upon the question of waste, there has lately been a discussion as to the sufficient W.C. flush. The water companies desire to restrict the quantity to two gallons. It is certainly not in this direction that the waste occurs. As the result of observation and experience, I am with those who demand the 3-gallon flush. Where the water is in the hands of the Municipal Authorities, the 2-gallon limit (I understand) is not imposed. Where the local conditions are practicable, there are great advantages in the municipal control of the water supply. The question as affecting the Metropolis is exceptional, and the municipal work already so vast, that many are of opinion that the control should be with a Special Commission or Water Trust. There are eight Water Companies in London, and the whole question is unfortunately so surrounded with party and commercial feeling as to obstruct all progress.

The suggestion of a dual water supply is akin to that of separate drainage, *i.e.* the separation of the sewage from the rainfall with the object of controlling the volume of the sewage at the outfall and obviating the flooding of basements by their connection with overcharged sewers. The sewage of a town is

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Farleigh springs, thereby greatly reducing the quantity supplied to the town, involving a further danger from the non-flushing of closets and drains. The Water Company called on the Corporation to use *other* water for road watering and sewer flushing.

ractically a constant quantity relatively to the population, hile rainfall is variable and intermittent. To construct sewers rge enough to carry off storm waters effectively, would involve ery great cost. Rain existed before towns, and from all time he waters have run their course in accordance with the physical onformation of the land. If men have planted towns and cavated their habitations in the natural water-way, they must pect occasional inconvenience when nature re-asserts her laims to her flood grounds. Dealing with facts as we find em rather than with the wisdom of our early settlements, in istricts liable to flooding it would generally be more economical r local authorities, while prohibiting new excavations, to com-nsate for filling up the old rather than construct sewers of orm proportion, which, as a matter of fact, do not afford the tended relief. The London County Council have now the wer to prohibit the erection of dwellings upon improper levels. he old provision for a quarter-inch of rainfall, upon which the etropolitan sewers were based, although generally sufficient, quite insufficient to give relief during heavy storms. In an drained town where the engineer is unfettered by existing nditions, a separate system may be adopted in whole or in rt;* but there are practical difficulties in its application to isting sewerage systems. A certain proportion of rainfall is sirable for flushing the sewers. Where local conditions admit erflow drains may, with advantage be laid to the river or tercourse, such overflows being constructed at such a level atively to the sewer as not to come into action until the sewer s been flushed of its impurities and become overcharged, when e town surface washings will have been carried into the vers by the first downpour. The subsequent outflow being rmless to the river.

The question of the proper size of house drains has recently en a subject of some discussion. As a general proposition size of a drain is governed by its gradient and required ume of discharge, but in house drains the flow is small and ermittent. Theoretically a pipe of only very small diameter uld be necessary. Some architects contend that for ordinary elling houses the drain should not be larger than four inches ernal diameter. No doubt the smaller the pipe the better the ur and less fouling surface. Many local authorities, however, uire a minimum diameter of six inches because, in practice, has been found that the smaller the pipes the greater the falls upon the Local Authority. Such experience induc requirement of a minimum diameter of six inches. Th connecting traps between the sewer and the house ar matters of much trouble, on account of the accumulati filth and their frequent blockage. Such things, howev matters of detail which do not affect the general princip sanitation.

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* The author largely adopted the separate system in the drainage of dstone, 1877.

Most of us are aware of that interesting conception late Sir Benjamin Ward Richardson which I had the pl of hearing him propound at the Social Science Congr Brighton twenty years ago, when he depicted an imaginary city of Health, Hygeia, in which every Sanitary detail perfect that certain forms of disease could find no possible and wherein hereditary diseases were so lessened in int that in the first generation the maximum mortality of t habitants of this favoured city would be only eight per tho reduceable in succeeding generations to Mr. Chadwick's es of a possible five per thousand due to healthy surrounding the healthy offspring of healthy parents. But no En or Architect ever had or probably ever will have the tunity of designing such a city. If some millionaire la were to appropriate some country side and comn some learned and discreet Professor to design and constr absolutely new city with dwellings, streets, drainage, supply, open spaces and every other sanitary factor pr arranged and capable of extension with the population, a result would no doubt be obtained. But the bulk o populations live in towns which have been developed olished and without angles. In food we must so study what to at, drink, and avoid and by an all-round anxiety to preserve ealth, render life not worth living. There is the happy nedium in all things which wisdom will dictate. We are, erhaps, sometimes open to the charge of some exaggeration, nd of being too theoretical. Small local practitioners, for nstance, take up our sanitary shibboleths and dogmatically scribe to sewers, gullies, or ventilators, illnesses for which they annot otherwise account. Even those from whom we should xpect more science frequently give their dicta without taking e trouble to investigate, and fall back upon the sewer as the ape-goat. Typhoid and diphtheria are generally ascribed to wers and drains, but nearly every large outbreak of enteric ver has, upon careful scientific investigation, been distinctly aced to contaminated milk or water, and not infrequently to ell fish, diphtheria being largely traceable to personal contagion, pecially in schools. In such cases less analytic scientific minds ould simply have denounced " the drains," it is so easy. Sewage not quite the polluting matter generally supposed; there e other sources of contamination besides sewers, matter in her forms which exist in the air or in food. Most certainly e introduction of town drainage has been followed by better alth and a lower death rate. On the Continent the death te is much higher than in England.

An important factor in Municipal Sanitation is the efficiency the executive. The best legislation is useless without proper ministration.

The Public Health Act requires that the Local Authority shall point "a fit and proper person" to the office of Surveyor. e "Surveyor" was once little better than a road-foreman, ocent alike of surveying and sanitation, the office has now eloped into that of an Engineer entrusted with the design d execution of important and costly works, and for the most t the public are now well served. Incompetent officers may be nd serving parsimonious authorities. The elected members o administer local matters should be advised by skilled cers respecting whose qualifications the public should have e guarantee.

The municipal engineer should have had a liberal education safe-guard him against the narrow motives and influences which he is surrounded. He should be something more than anitary "expert." He should have practical experience in eral engineering. In the medical profession the specialist any particular subject has had to satisfy his examiners in eral professional knowledge. At present the office of engineer is open to any brass plate man, who may obtain responsible official positions upon the mere testimonials or votes of good-natured friends. It is on record that a bankrupt linen draper was set up again in his native place by his neighbours appointing him as a "fit and proper person" to fill the office of Town Surveyor, justifying their selection by the fact that he had been "used to measuring."

The Sanitary Institute, as also the Association of Municipal Engineers, have established examinations to test the knowledge of aspirants for public sanitary offices. Such examinations may not be an absolute proof of general fitness, but I am sure, speaking as an Examiner of the Royal Institute of British Architects, of the Association of Municipal Engineers, and of the Sanitary Institute, they afford *primâ facie* evidence that candidates who satisfy the examiners are not mere quacks, and in the absence of other tests, local authorities would do well to require such certificates or diplomas of those whom they appoint. The Universities have now established Certificates and Degrees in Public Health. It should not be competent for anyone not holding a qualifying certificate from some recognised examining Board to present himself as a candidate for any of the higher municipal offices.

I have long advocated that the skilled and responsible Municipal service of the country, offices created by parliament, should be allied to the Civil Service on a system somewhat analogous to the County Surveyorships of Ireland, which should include the Medical Officer and the Engineer, extending also so far as he acts independently, to the chief Sanitary Inspector.

The executive sanitary officers are especially liable to attack and should be protected in the efficient discharge of their duties. Those who wear the shoe know where it pinches. If the duties are actively and impartially performed they come into acute contact with ignorance and pecuniary interests, as recognised in the report of the Royal Sanitary Commission. "Great (they say) is the *vis inertiæ* to be overcome, the repugnance to self-taxation, the practical distrust of science and the numbers of persons interested in offending against sanitary laws, even amongst those who must constitute chiefly the local authorities to enforce them." In another passage the Commissioners advise that sanitary officers should be able to discharge "their duties without fear of personal loss." Local Authorities frequently lack consistency, and decide similar matters differently at different times in accordance with their changeable humour, or the influences brought to bear upon them by those who have axes to grind or logs to roll. In the language of the Royal Commission, officers "are too dependent on their immediate employers to be thoroughly efficient." The Building Surveyors of the Metropolis are required to pass a statutory examination, they work directly under the Act of Parliament enforcing the law through the Courts of the Stipendiary Magistrates and thus avoid the "anarchy of local administration." Such officers are amenable to public opinion exercised through the London County Council uninfluenced by personal feeling and local cliques.

The County Surveyors of Ireland obtain their appointments by competition in an examination held by the Civil Service Commissioners. The subjects of examination cover a wide field of knowledge both theoretical and practical. If a canditate fails in theory he is excluded from the practical branch of the examination. If he satisfies the Examiners in both branches he has also to show that he has had practice of adequate works. Health and character are also strictly enquired into. The examination includes the various branches of Mathematics, Natural Philosophy, Geology, Mineralogy, Experimental Science including Chemistry and Electricity. Most of the County Surveyors of Ireland are University Men, they are not subject to the likes or dislikes of changing Local Authorities but to the Lord Lieutenant. They also have fixity of tenure and a retiring allowance. Under such conditions municipal service would have a prestige and offer an attraction and a career for well qualified men, a service which a man might hold with self-respect. Such is an ideal of what the Municipal Service of the Country should be. The Local Authorities might select and appoint any certificated candidate but when appointed he should, as originally under the General Board of Health and as at present even Poor Law Officers, during good behaviour have the protection of a higher power and superannuation when his working days are over. Public Office at the best, is very harassing to a sensitive and high spirited man, and avoided by many of the best qualified, therefore unless sufficient inducement be offered efficient service cannot be expected.

At the last annual meeting of the Association of Municipal Engineers Sir Alexander Binnie, the President, emphasised opinions to which I have often elsewhere given expression: "The Local Authorities," says Sir Alexander Binnie, "are elected and deliberative assemblies, and it is of the greatest importance to the public welfare that they should be so constituted. At the same time, however, we must often feel that there is a great deal of energy wasted in the useless discussion of professional details. When a man consults his medical adviser, or his lawyer, he generally abides by his decision, and without cavil carries out the advice he receives. Up to a certain

of course the bodies under whom we work must d
neral principles of the work which they propose to s
: but having done so, I think it would conduce t
al welfare if there were less discussion of details
ism of uncompleted work, on purely professional det
k that too much criticism leads to a waste of energ
oves us by every means in our power to raise the
us of our profession. Our Association (Municipal
ers) by the certificated examinations which they have insti
ve commenced that good work and the Institution of
ngineers, the general governing body of our profession, i
orking on the same lines and it is to be hoped that befor
e shall receive that confidence which our merits deserve.'
Such an expression of opinion from the Chief Mun
Engineer of the World must have the greatest weight.

It is not, however, by legislation or officialism tha
progress is to be made, but in the education of the p
It is a political axiom that legislation should not be in ad
of public opinion. It has been well said that it requires a
siderable time to instil new facts and doctrines into the
mind, and a still longer period before knowledge takes the
of action and legislation. Lord John Russell was of o
that no great change could be effected in this country
thirty years. It is not much more since, as already de
the first earnest and practical efforts were made in this
for the promotion of sanitary work, and seeing how diffic
up-hill has been the work, it is an obligation on all sa
to take a part in promoting the education of the people
matters.

In 1870, impressed with the want of public appreci
difficulties and the obstructions which surrounded th
sanitary engineers, I invited the co-operation of
engineers and surveyors of the country in forming an
which was inaugurated at the Institution of Civil
in May, 1873, when I had the honour of being a
first president. This pioneer of Sanitary Associat
incorporated as the "Association of Municipal
Engineers," numbering some 800 members in
Kingdom and the Colonies, who interchange th
experience upon all matters relating to municipa
About four years later the Sanitary Institute of
was founded upon the wider basis of includi
interested in promoting sanitary work and popul
knowledge, apart from the professional eleme
common to the two associations was to sec

qualification of those officially engaged in sanitary work. The Universities followed by instituting degrees and diplomas in Public Health. Other societies with allied objects have ollowed in our wake. There is room for all, each working in ts own way in the interests of the public health.

There was an earlier association with which I was also closely ssociated as a Vice-President, now extinct, but whose work hould not be forgotten—the "National Association for the promotion of Social Science," established some forty years ago with ord Brougham as its first president. This association, as its ame implied, had wide objects including such subjects as International and Municipal Law, Economy and Trade, Administration of Justice, Repression of Crime, Education, Art, and Health. It is obvious that so many objects, with their ramifications and subdivisions, would grow beyond the work of any one sociation. The progressive public interest created in each epartment of the association's work induced the formation of pecial societies which took up the subjects in detail. The ational Association opened the way, accomplished good work nd, like many other pioneers and reformers, handed over its ork for others to carry on; it laid the foundation upon which hers built.

We have dwelt upon the troubles and the difficulties of e past. Like the Gilbertian policeman, the municipal officers e has not been "a happy one;" they have been as shuttlecks between the sanitarians and the "muckabites." Hitherto e engineer and the medical officer have been in advance of, d waiting for, public opinion. We, the seniors, who have en the martyrs, and gone through purgatory, hope it may unt against our mistakes and short-comings. The generation coming officials will have a very different experience to those ho have preceded them, they will inherit the accumulated owledge and experience. Instead of apathy and obstruction pressure will come from without. As the people are ucated, the tables will be turned, the attack will be upon icial apathy rather than over zeal.

A new and unexpected force is already making for sanitation, demand is coming from the working classes, formerly so athetic. Their labour representatives on local authorities, of hom I have had some experience, are now eager in promoting nitary inspection, perfect drainage, improved dwellings, public ths, recreation grounds, &c. Whether their action arises m a new appreciation of sanitation, which individually they ve been too apt to disregard in their homes, or is an outcome the antagonism between socialism and landlordism, the result

common people only common sense in the applicatioı
should be common knowledge. But how difficult is it
compliance with the simplest rules even by our own
who, having no appreciation of their import, regard
"faddy" and "fussy," they formed no part of their
experience, nor of their school education.

Sanitary works and a sanitary staff, of course, m
We freely tax ourselves for all kinds of personal luxu
to our detriment, but rates for preventive sanitary me
paid grudgingly. As a matter of social economics th
health, comfort and prosperity, is to be credited as a
loss of labour, waste of capital, and cost to the nation c
upon sickness and pauperism. Without health all
vantages are diminished or lost, therefore, the con
health, so far as they are under our own control, sh
subject of the education of the people, the elements o
should be taught in our board schools, in our hig
and in our colleges, illustrated by practical obje
supplied by landlords.

The extension of local government to the whole co
the establishment of district and county councils
important advance in national sanitation. Every
England and Wales has come within the cogniza
sanitary authority. The hamlet and the village,
neglected, is now within the purview of the medical o
inspector and the surveyor.

Among other valuable features of sanitary progr annual report of the Local Government Board (1895-6) quotes the outstanding loans of the country at the enormous amount of £224,158,376, being an increase in the last twenty-two years of £131,338,270. Such figures speak for themselves as to what has been done by local authorities for the health, comfort and convenience of the people.

Although we recognise with satisfaction the awakening of public feeling, the progress made and the results already accomplished, we cannot yet "rest and be thankful." Much useful legislation is not enforced and much remains to be done in many of our towns and cities, and especially in rural work, for most of our villages are still awaiting the hand of the sanitary engineer.

There are other matters, such as the suppression of smoke rom factories and the fouling of sewers and rivers by trade vaste and factory refuse, which public feeling will, in time, deal vith as effectually as with other offences of the past.

We shall enter the twentieth century, late, although it be, vith full hygienic knowledge of the sound principles of sanitary vork and the practical experience of the engineer and the rchitect. Every vital question has been discussed and, for the nost part, legislated upon. We have the knowledge and we ave the power, and require only the will. The will lies with he people and can only be called into action by their education; is necessary, as was said by Robert Lowe, that we should educate our masters." Amid all the agitations and unrest of his *fin-de-siècle* there are no conditions which would contribute nore to the comfort and welfare of the community than nitation, education, and thrift.

SECTION III.

CHEMISTRY, METEOROLOGY, AND GEOLOGY

ADDRESS,

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PRESIDENT OF THE SECTION.

Tria Juncta in Uno.

The President of this Section is placed in some difficulty, a he has to represent three sciences, and to pose as a livin representative of a Trinity in Unity. If in trying to fill suc a post I should stop far short of success, let not the failure b credited to the defects of an ordinary mortal, in no wa answerable for an arrangement assigning to him an apparentl impossible task. A three-legged stool is undoubtedly the mo unstable of seats, and therefore if I slip, it is the fault of th chair that I have to take.

It is true that, with an eye to human fallibility, the Counc select a President from the votaries of one of the three scienc in succession, leaving him to speak on his own science and more or less ignore the other two; but I have thought that might be well to choose a subject in some way common to a three for the discursive remarks which are all that I can offe After much searching of heart, strange as it may seem, th only common ground that occurs to me is *water:* indeed th subject might also include a great part of the other two Sectio into which our Congress is divided.

In the first place as to the meteorologists. It is clear th we owe all our water directly to them, and that they are n answerable for the many objectionable materials that so ofte get into the water, not even for the salt, of which we sometime have unpleasant experience in supplies along the coast.

In the past twelve months there has been a respectable rainfall, resulting (amongst other things) in the replenishment of our stores of water, and to such an extent underground as to bring on the formation of the bournes, the outbreak of springs in places where the water-level, in permeable rocks, is usually at some depth underground, causing thereby the flow of streams in valleys, or parts of valleys, that are usually dry.

This has occurred in the two well-known examples north and south of London, in Hertfordshire, and in Surrey. Water broke out in the Kenley Valley (part of the watershed of the Wandle) at successively higher points and flowed over the urface to successively lower points, until the stream reached rom the junction of the two valleys north of Marden Lodge o the Brighton Road northward of Purley Station, a course of bout four miles.

Some weeks later the Hertfordshire bourne rose, in a tributary valley joining the valley of the Bulbourne at the place alled Bourn End, a mile and a quarter above Boxmoor Station. he springs rose higher and higher up the valley until the tream started, at the boundary between Hertfordshire and uckinghamshire, in the bottom of the valley southward of larrats End and about two and half miles above Bourn End, t which latter place it joined the River Bulbourne.

I saw both these bournes, the former repeatedly, and it was ery interesting to see the unusual stream, with occasional roadenings-out into fair-sized ponds, flowing over grass-land ad through gardens, here and there making incursions into ables,sheds, cucumber-frames, &c. In the Hertfordshire case goodly length of roadway, at the lower part, was turned into stream.

At first sight it may seem strange that the outburst in the vo tracts should not have occurred at about the same time, oth being of the same geologic formation, the Chalk. The planation of the difference in time of starting seems to be at in the southern tract the outcrop of the Chalk is narrower, e dip of the beds and the slope of the ground at higher gles (though far from high); from which it follows that the ater would find its way more quickly from higher to lower vels underground than in the northern tract, where the oader outcrop, due to lower dip and accompanied by lower neral slope, tends to delay the underground flow. I venture give this explanation, until a better one is offered.

There is no need to say more of these bournes, the occurnces having been carefully recorded in both cases, as they ve been in earlier outbursts. Indeed, I have an idea that e Surrey bourne is sometimes thought to be in the hands of r Fellow, Mr. Baldwin Latham. At all events he names the y when an outburst may be expected, and his orders are

punctually attended to. These streams are, of course, onl
two of a great number of such occurrences; but I fear th
others are not so well recorded, at least we do not hear th
they are.

On 12th March, 1897, I saw a like thing, on a smaller scal
in the Magnesian Limestone tract near Mansfield, where th
floors of stone-quarries, at Mansfield Woodhouse Station an
westward, were under water, and there was a flow for a sh
way along the Valley of Debdale Lane, in two places, o
southward of Debdale Hall, the water sinking again after
time, and the other from east of the Hall.

Of bournes generally one may remark that, whilst years a
there were various wonderful theories accounting for the oc
sional outflow of water, the progress of science has simplif
matters, and we now know that these outbursts are mer
owing to rise of the underground water-level, after seasons
heavy rainfall, until it becomes an overground one along
bottoms of valleys.

There is one other satisfactory matter on which mete
ologists and The Sanitary Institute generally can be heart
congratulated, workers in all sciences joining in the voice
congratulation: it is the award of the Albert Medal by t
Society of Arts to one who may well be called our good Fello
Mr. G. J. Symons. In his particular domain it would ne
some hardihood to venture on anything approaching to fau
finding: but I would humbly suggest that sometimes we shou
not be averse to more information from the higher ground
These are naturally the parts where the greatest rainfall is
be expected, and they are of special importance in regard
water-supply. Of course, they are those about which it
generally most difficult to get information. In parts of t
low grounds the amount of rainfall is practically immaterial
reference to the subject of water-supply, from which point
view it matters little, for instance, whether there is a fall of
inches or of 100 inches a year in such places as London, Live
pool, and Manchester (or even in Leeds), though from oth
points of view there may be something in it.

The important science of chemistry has been duly recognis
in the Jubilee honours, and all of us must have been glad
have found the already well-honoured names of Frankland a
of Crookes in the list. With regard to the former, the Ord
of the Bath seems to be a most appropriate award for one w
has done so much for water.

I take the opportunity now offered to ask to be allowed
utter a protest, not against the matter with which chemist
provide us, but rather against the manner in which they ofte

present it to us. In doing this of course I have no notion of arrogating to myself a superiority over my chemical brethren: I only ask that they should consider the feelings of those who, though not themselves chemists, have often to study chemical analyses. It would be a great advantage to us if they would agree to use one system in stating their results, instead of several. Now-a-days, when one gets a chemical analysis, one has to see in what language it is written, whether, for instance, the results are given in grains per gallon, or in parts per hundred thousand, with an occasional limit of deviation to a million. We may be told that we have only to multiply by ·7 to change one set of figures into the other; but I venture to submit that life was not given us for the purpose of carrying on the process of multiplying by ·7, and that some of us might be better employed than in following that occupation. In common with most people, I like to have my food cooked for me. I can then give my undivided attention to digesting it.

Another common defect in water-analyses is not due to the chemists, but rather to their clients: it is the imperfection of most analyses. Folk seem to think that it is generally enough to know whether or not there is any organic pollution in a water; but I do not hesitate to say that it is sometimes as important to know the mineral contents. When these are known the geologist is not left wholly to his own devices, which are very various, in trying to trace out the history of a water, but is greatly helped by the chemist. Full analyses of water are of great value, and clearly we want more chemistry.

The following complaint is hardly one that should be limited o chemists; but they are frequent offenders, and what I enture to call a wrong practice may be noted here, namely, the ddition of needless noughts after decimals. No one can deny hat "a tenth" is a better expression than "ten hundredths," ar better than "a hundred thousandths," and immeasurably bove "a hundred thousand millionths." Yet they all mean the ame thing! When put in figures many folk prefer anything o the first, ·1 won't do for them; but they must put a long rray of 000 after the 1. This may be impressive, but surely gures are among those blessings of which one may have too uch.

Coming now to more general questions in regard to water-pply I must ask forgiveness if my erratic remarks stray ross our boundary into the domains of other sciences or ursuits.

In the course of the past Session of Parliament two Bills, romoted by the Corporations of Nottingham and of Newark, ad a somewhat lengthened consideration in a Committee of the

House of Commons. Luckily they were taken together, or th nineteen days given to them might have been extended t thirty.

This enquiry, during part of which I was present, had som peculiar features. In the first place there was not a singl Company in the case; but there was a multitude of corporation and of other local authorities, opposing the whole or part o both Bills, and one was tempted to say, "How these Council love one another!" A second peculiarity, and one which thi Section must feel to be a very bad one, was the absence chemists, an occurrence previously unknown I believe in such case! The fact is that no question of quality arose. Everyo knew that there was good water to be got, the only things settle were, firstly, who was to have it, and then where th were to get it. In both cases the New Red Sandstone was t source of supply involved, and by means of wells.

But, besides these trifling peculiarities, a point came up both bills, one, I think, of great importance, and likely perh to lead to results toward which engineers and others have b striving for some time. It may also lead to results o specially sanitary kind, and it is in the hope that this may the case that these bills are now referred to.

In each case the promoting corporation asked for what called, I believe, a protective radius; really a ring within whi no other works for public supply should be established, th own works being, of course, the centre of the circle. A p tected area would clearly be a better term, as no good could got from an abstract idea like a radius.

One of the two schemes was for the supply of a populati of 20,000, whilst the other was for a population nearly 15 tim as large. With the usual perversity of human nature, t promoters of the smaller scheme asked for the larger radi (four miles), and to have it for nothing: the result being th finally the application was unsuccessful, whilst the promoters the larger scheme asked for a smaller radius (two miles) a got it, by paying for it.

It seems not unlikely that this question of a protected ar round a waterworks will occur again, and frequently. Clear there is some justice in the notion that a public authority or company spending money on getting a good supply of wat should have some direct guarantee that its efforts should n be frustrated by other work being undertaken too close to Naturally there will be difficulties in making such arrangements, but I cannot see why our engineering brethren should not be able to surmount them, if, with their usual modesty, they do not open their mouths too wide.

Of course, each case must be decided on its own merits. No hard and fast rule should be striven for, as what may be ample in one case may be far from it in another. Nor, perhaps, should there be the geometric simplicity of a circular area in all cases.

I have clearly been trespassing in the domain of the Engineering Section; but this trespass may be forgiven as it has been done for a good object, the finding of a text for a very short sanitary sermon. Service on a Government Survey has made me so used to going over other people's property, for many years, that I am loth to give up the practice, though no longer an officer of that Survey.

This question of a protected area round waterworks seems to me to be one that should be extended beyond the original purpose, and from a sanitary point of view. Whilst recognising the importance of getting water free from interruption, let us not forget the at least equally important matter of keeping the water free from pollution.

There are some people who would not allow the establishment of any sewage-farm, or perhaps of any cemetery, on a water-bearing formation; but this seems too much to ask for, as there may be places on such formations where, as far as one can see, no harm can result from such proceedings, and we must remember that sewage-farms and cemeteries must exist, until some other methods of disposing of waste material are not only found out, but are generally adopted: moreover, such institutions cannot always be far removed from populous places.

Surely, however, it is not unreasonable to suggest that round each work for the public supply of water a certain tract of the water-bearing bed should be saved from the assaults of surface-contamination. We are yet without much information as to how far pollution may be able to reach along an underground course, and there is still great dispute as to its extent along an overground one. Clearly here, too, each case would need careful consideration, both as regards the position and character of the waterworks, and the nature and amount of the possible polluting-cause, lest work should be stopped at places where it would do no harm, or allowed at places where harm is likely to ensue.

It has been legally settled, by the case of Ballard *v.* Tomlinson (which I had the pleasure of bringing under the notice of The Sanitary Institute in 1885), that no man has a right to pollute the water in another man's well, where communication between the work of the polluter and the well of the polluted can be proved. But this does not go far enough for sanitary purposes. We want to stop the pollution before it is proved.

The sanitary requirement is that no pollution shall be allow on a water-bearing bed where such pollution is likely to affec neighbouring waterworks or well. I do not see that at prese we can go beyond the bounds of probability; but that is a wi range, quite enough to stop many doubtful practices. Whet we shall ever be able to go to the extent of possibility is anot question.

It is here that geology comes in, for the nature of t surroundings of waterworks must be taken into account, oft for some distance and to some depth.

The character of the beds at the surface is of course ve important and an ordinary geologic map, on which the Dr (gravel, loam, boulder clay, &c.) is not shown may sometimes misleading in this respect. As sanitarians we should rejo therefore at the revision of the Geological Survey Map whi has now been going on for several years, and, including mapping of the Drift, a revision that really amounts to a work rather than merely to a new edition.

In southern England the Drift has been mapped published on many sheets of the old map, including the whol the counties of Essex, Middlesex, Norfolk and Suffolk, wit great part of Cambridgeshire, Hertfordshire, Kent, and Sur and with a smaller part of many other counties. This w has also extended further northward, into some of the Midla Counties (though very little has yet been published); but in far the greater part of the wide tract referred to it has be done only on the old one-inch Ordnance map, the topograp of which is often inexact. In parts certainly it has been do on six-inch maps and then reduced to the one-inch scale, f publication, a task of some difficulty where the old one-inch ma had to be used. A survey of the Drift in the London area the six-inch scale is greatly needed.

It was only in the North of England, where the Ordnan Survey is of later date (as well as in Ireland and Scotland), th the one-inch maps were reductions from those on the six-inc scale; but here the Drift has not been published in all cases.

Now, however, several of the new one-inch maps of southe parts have been published by the Geological Survey. In the not only have divisions of the Drift been shown, and for t first time (except in parts of Sussex, where the new work ha been reduced also on to the older maps), but also great additio and many alterations have been made in other respects, ma details of division appearing for the first time. The counties Dorset, Hants, and Sussex, as well as parts of South Wal have thus benefited, and others will soon have the li advantage.

It is not generally known, I think, that though the six-inch maps, on which the new work is done, are not published (except in the case of coal-fields), yet MS. copies thereof can be had, at the cost of making them. Sanitary authorities should avail themselves of this important help.

Since the above was written I have been favoured with a proof of a Geological Survey Memoir, entitled "Soils and Subsoils, from a Sanitary Point of View; with especial reference to London and its neighbourhood," by Mr. H. B. Woodward. After a general geologic introduction it treats of the soils and sub-soils of London and a large tract around, the geological formations referred to extending downward to the Hastings Beds, and the following subjects are dealt with:—The Sub-soil in reference to Sites for Houses; Water-supply and Drainage; General Sanitary Conditions with regard to the Situations and Surroundings of Houses and Cemeteries. It seems to meet the wants of the many enquirers after healthy sites for houses, and should have a rapid sale, if only Government would make its existence known. As sanitarians we must hail this new departure and hope that this first attempt may lead to further work of the sort.

The importance of the Drift in questions of water-supply has been alluded to at various times and for various districts. As regards part of the Chalk-district the subject was brought before The Sanitary Institute, at the Portsmouth Congress, in 1892.

In many cases waterworks are on more or less impermeable beds, the water being got by shafts or borings carried down through these to underlying water-bearing beds. In such it is clear that Nature has herself provided a protected area, though often one may have to look beyond this, according to the distance at which the water-bearing beds rise up to the surface.

Where waterworks are placed on the beds from which the supply is got, such as the Chalk or the New Red Sandstone (our great water-bearing formations), or on overlying permeable beds, without any intervening impervious ones, it is obvious that the risk of pollution is greater and the desirability of a protected area essential. In such cases no source of pollution should be allowed to be set up within easy range of the source of a public water-supply, and any causes of pollution already existing should be got rid of as soon as possible. All the larger sources of pollution should indeed be kept as far from waterworks as possible; to say that none should be allowed to exist anywhere on any great water-bearing bed is to soar from the regions of the practicable into the sphere of poetry. The getting of good water and the keeping it good are amongst the nt things we have to do; but they are not

narks, it will be seen, refer to water got from l, by wells and borings; but they apply also to the ings, which are only the outflow of water that has ously more or less underground. To extend them to lies that are got from lakes or streams would involve er considerations, and some of a far wider kind. We pleased that the late Royal Commission on Metro- Water Supply has seen the advisability of greater by Conservancy Boards, over the rivers that give the ipply to our great city; and it seems to me that without reater control, the seven large companies taking this are put in an unfair position. I can never understand n these matters the Lee should be separated from the nes, for the former is just as much a part of the latter as of the many other tributary streams, and probably would e been considered so had it not been for the fact that it was arately and specially taken for the supply of the oldest of e seven companies. I am far from wishing to disestablish r Fellow, Major Flower, who is so energetic in looking after ne Lee (especially after the address that he gave at the Congress, p. 317); but surely it is time that the division should cease, and that the whole of the Thames should be under one strong Board.

In an address to this section, given eleven years ago, and in this same county, I alluded to various proceedings that had come before me and which seemed inadvisable in view of the probability of the contamination of water. Since then I have seen few cases of this sort of thing of importance: on a very small scale of course they are common. One however much astonished me, and it should, I think, be noted.

On a late visit to Tunbridge Wells, an inland health-resort, I accidentally came across a place, on the northern outskirts of the town, where sewage was allowed to flow into an old pit in the rock-bed of the Tunbridge Wells Sand. The quantity flowing in was probably small, but apparently the flow must have gone on for some time, as the crude sewage seemed to have clogged the pores of the fine-grained sandstone, and any cracks or fissures in it; so that a pond of liquid sewage, of an odorous character, was formed in the bottom of the pit. Presumably a great deal more fluid had filtered in through the rock than had remained behind. It seems lucky that the tract of Tunbridge Wells Sand from which the town is supplied with water is separated from the place referred to by a valley, cut through to the underlying clay. My visit was a very short one and left me no time to follow up this interesting subject; but I think that there is no underground flow toward the much-frequented mineral well in the town, a mile or so southward. What I wish to enforce however is that though no harm may be done the proceeding is, at all events, of doubtful expedience. [I am glad to hear that practically it has ceased. Oct., 1897.]

Another and smaller case, of which I have heard only lately, is of interest as having been set up by a powerful body which, perhaps, ought to have known better. A new station has been built for the Metropolitan Police in the bottom of the Chalk Valley at Kenley, in Surrey. It had to be provided with a cess-pit, there being no drainage-system there, and this has been made more than 30 feet deep, so as not to need emptying. It is well that this is below instead of above the East Surrey Waterworks; but it is to be hoped that the District Council vill take some steps to make the Metropolitan Police move on, n a sanitary sense. The County Council, unfortunately, has o power to interfere, or I should imagine that Dr. Seaton vould have something to say.

It is more pleasant to turn to cases where preventive easures have been taken. Such a case has lately occurred at ne of the largest of our southern provincial waterworks, where he possibility of contamination has led to extensive work being ken to avert it. At the Bedhampton Station of the Portsouth Water Co. the powerful springs from which the supply got have been bordered by a polluted stream, at a lower vel. No proof of communication has been found; but the resence of a bad neighbour has been got over by diverting the ream into a line of iron pipes, 5 feet in diameter, for a istance of more than half-a-mile, beginning some way above e works, where communication with the Chalk is cut off by a ick mass of overlying clay, and running southward to a tidal eek below them. I believe that (with the exception of some pes of 6 feet diameter, along the New River) this is the ggest set of pipes in the kingdom, though, of course, nothing rticular in length.

Some of the London Companies, adopting the Report of the oyal Commission, have greatly extended, or are greatly exnding, their storage-reservoirs and their filtering-beds, thereby t only ensuring a larger supply, but also a better one. There no need now to enforce the advantage of filtraton in such cases.

One may allude to a cause of damage to water common to pplies along the coast, the drawing in of sea-water. This not pollution; but when it goes beyond a very small amount is disagreeable and expensive, the water becoming practically eless for many purposes. The most notable case, and one which has been much before me for some time, is Eastbourne, a watering-place of deservedly high repute, but which has probably suffered a good deal for some two years past, by reason of a considerable amount of sea-water having got into the public supply. The works are no great way from the sea, but they supplied the population for many years satisfactorily. Great increase of population led to much-extended pumping, and, after a set of dry seasons, drawing in of salt water followed. This, unfortunately, was strengthened by an extension of works, one of the galleries having been driven into a much fissured rock, the fissures having presumably a fairly free communication with the sea.

The Water Co. took steps to cut off the specially offending gallery, and was forced to keep down the water in it by extensive pumping to waste. It annexed a set of springs from the base of the Middle Chalk on the coast, at Holywell, westward of the town, which yielded nearly half-a-million gallons a day, from which source a separate supply was given (for potable purposes) for some time. A trial was made, though unsuccessfully, to get a supply, by deep borings, from the Lower Greensand, that formation being found to be so thin as to be practically of no account. Water was also taken from the Lower Chalk by a shallow well near the foot of the escarpment in Wannock Glen, north-westward of the town. Finally, having secured a site in a Chalk valley near Friston, larger works were begun there, and, as I write, this water is being delivered into the town by a temporary line of pipes carried over the high ground of the Chalk escarpment.

I am glad to be able to note these cases of Water Companies doing their duty to their consumers at great trouble and expense. Those of us who may have a general feeling in favour of corporations having the control of the water-supply should not let that blind us to the fact that companies can carry on their work properly, and in some cases probably better than corporations could, for there are cases where a company can do work more quickly and can spend money more freely than is in the power of a locally elected body.

Having succeeded, in the above remarks, in getting outside the boundaries within which they should have been kept, one is tempted to continue the process of straying further afield from one's own wide domain, and to notice a question of public policy, which seems to be unprovided for by any of our sections, and so may fairly find a place in the chemico-meteorologico-geologic dust-bin, especially as the first and last of the three sciences generally claim that all earthly knowledge comes within their respective territories.

It seems to me that one of the lessons that ought to be arnt from the Parliamentary Bills above-noticed is the lvisability of some sort of federation in the matter of water-pply in many places. One saw the not over-edifying specacle of a number of authorities scrambling for water from the ame source, geologically, and got or to be got by the same neans: every man's hand against every other man! As a natter of fact there seemed to be plenty of water for all, with vailable sites for getting it. If the various authorities who ave to get their supply from the common source, in this case he New Red Sandstone, could only be brought together in ome bonds of brotherhood much expense might be saved to all.

In the case of companies, formed solely for the supply of vater, this could be brought about by fusion. As an example f a widely extended business of this sort the South Staffordhire Waterworks Co. may be instanced, its district having a ngth of 40 miles, with a breadth up to 20, the area being bout 276 square miles. This includes 48 towns or parishes, mongst them being Burton-on-Trent, Cannock, Darlaston, udley, Smethwick, Tipton, Walsall, Wednesbury, and West romwich, the total population being over 560,000, of which bout 460,000 probably are supplied, the water being mostly om deep wells in the New Red Sandstone.*

In the case of corporations and councils this fusion of course annot be made, their work including so many things besides e supply of water, and some of these being of exceptionally cal interest. It often happens, however, that a town supplies ore or less rural districts around it with water, or takes their wage. One does not see therefore why a set of towns or her local authorities should not be able to combine for the rpose of having joint-works, whether by the formation of a ater Board or in what other method, being a question to be ttled after due consideration. This is sometimes done in comratively small cases; but one would like to see it extended to rger examples and to include existing works.

Perhaps the most peculiar case in the kingdom, as showing e need of combination, is that of the chief city, wherein ght companies hold divided, but often concurrent, sway, their stricts overlapping in a most elaborate way. We have many ondons! a City of London, a Municipal London, a Water ondon, a Postal London, a Police London, a Registration ondon, and perhaps other Londons, with boundaries that are ything but coterminous. From the point of view of those who prefer that the water-supply should be in the h company rather than under the control of a corpc would surely not be held that in the multitude of (there is wisdom. I have long wondered why the Lor panies have not strengthened their position by some a combination. A federation for the northern side of th(and another for the southern, would have been of vantage, and is as much division as there should be.

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* Presidential Address, by Mr. A. Hill, the Company's Engineer, to the ociation of Waterworks Engineers, 1897.

Of course the suggestion of federation in the i water-supply will be met with the plea that there are : great difficulties to be overcome; but difficulties may l as things that have to be overcome. We have a gooc engineers, financiers, and such like, whose chief obj(getting over difficulties, and who are useless if they ca that object. I was about to include lawyers, but a deference to the opinion of many, that their func' create difficulties, a view which I don't altogether hol(

Though one may almost despair of seeing any chan number of water-authorities as regards London, surel) cases our corporations and councils, urban and rura something in the way of agreement amongst themselve benefit of the public which they represent, and in this County Councils, with their wider range, should help. the healthiest developments of our public life of lat(the increased regard for local government, whether by Municipalities, Districts, or Parishes. We may sure this to have a good influence on public water-supply : sanitary questions.

In the matter of combination this Congress, and espe(Section of it, may be taken as a good example. We as the representatives of distinct pursuits, banded tog for the special interest of each, but for the good of al work for the public good. We are divided into three and this one has again a triple division. In our work I hope, adopt the motto that goes with the three-legge(of the Isle of Man, *Quocunque jeceris stabit.*

Postscript, October, 1897.—The need for some pro' sources of public water-supply, whereby their conta may be avoided, is being strongly shown by the ou' enteric fever at Maidstone, the only apparent cause is polluted water. The number of cases has reache(1600, and the disease has spread to other places.

CONFERENCE ON RIVER POLLUTION.

ADDRESS.

By Major Lamorock Flower, F.R.Met.Soc.,
Sanitary Engineer, Lee Conservancy Board.

President of the Conference.

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this "record year" I deem it a high honour to be selected preside over this Conference, and I venture to hope that me practical and useful results will follow our consideration a subject which is certainly by no means an unimportant anch of sanitation.

I think it will be admitted, nay, we have high authority for e assumption, that if we wish to succeed in an undertaking, should meet in conference, discuss the subject from all ints of view, learn from each other's experience, perchance ofit from others' failures, and having formed conclusions, *act*. oreover, at these meetings, and especially in the discussions papers which are contributed, many words of great value are oken, which otherwise would have remained unsaid, words hich perhaps may leave their impressions, and also be found practical use in the future, and we can realise the fact that

> " Many a shaft at random sent,
> Finds mark the archer never meant."

We live in a practical age, the general endeavour seems to be get the greatest amount of efficiency at the lowest possible st, and in carrying out a great public good we must try to serve as much as is possible the private interests which are ected—for while we look after our public health, we must t neglect our trade.

When, forty years ago the Apostle of Sanitation, the late r Edwin Chadwick, K.C.B., presented me with copies of the ports of the First Board of Health and made me a disciple, being at the time one of the governors of a military college which I was a professor, and which was under the direct tronage of the Royal Duke who is now President of the ilitary Institute, I little thought that I was destined for the ique position which I occupy of being the first appointed and then the only officer in the Kingdom in charge of a watershed area for the purposes of sanitation.

The Lee Conservancy Board, whom I have had the honour to serve for upwards of twenty-six years, is the senior body of Conservators in the realm, and dates its origin from the reign of King Henry the Sixth, A.D. 1424; by "the Lee Conservancy Act, 1868," it was charged with the duty of preserving the purity of the water of the River Lee and its tributaries, in addition to its somewhat limited functions of preserving and keeping open the navigation of the river from Hertford to the Thames—this gave the Conservators control over the entire watershed, an area of about 600 square miles, from which a considerable proportion of London water supply is drawn; and they constitute the first public body in the Kingdom having charge of the whole catchment area of a river.

This fact first impressed me with the notion that the formation of similarly constituted authorities over the entire Kingdom would be valuable as a means to the desired end o purifying our rivers. This I set forth in a Paper which as member I read at the Conference on Health and Sewage o Towns at the Society of Arts in May, 1876, in these words:—"If we are to have our rivers purified the whole country shoul be mapped out into districts, each under a competent sanitary officer, who should have large powers, under Conservancy Boards formed to legalise his acts."

This fact becomes still more firmly established as years of experience pass on. I submit that the watershed line is the proper boundary of such districts; the idea is slowly but surely developing, and the reason why I say the boundary of such jurisdiction should be the watershed is, that often in the upper tributaries of a main river most dangerous pollutions exist, such as ditches into which the refuse of villages and large residences passes, often containing pollution from trade refuse, which refuse decomposes and is ready to be washed forward to the main stream by the next heavy rainfall.

As one outcome of the recommendations of the last Royal Commission on London Water Supply in 1892, at which I was a witness, the conservators of the River Thames have had their jurisdiction extended to the whole watershed; after for many years being only in charge of a limited area of country on either side of the banks of their main river. It would be interesting to learn how prevention of pollution is managed in this large watershed. We have recently heard much of the condition of the River Brent, one of its tributary streams, and apparently much friction between the local authorities;

action of the Middlesex County Council; the Local Government Board; and ultimately questions in the House of Commons. This leads me to speak of the manifest imperfections of the law in respect to pollution of rivers. I think it well to put this in the forefront; and in as few words as possible, will call the torchlight of history to our aid in considering it.

I find from Hansard that the first practical movement towards the end came about when an attempt was made in 1855 to get a clause in the "Nuisances Removal Bill" extended so as to include *all* manufacturing refuse of a foul and oisonous nature. The clause in question proposed to impose a enalty of £200 for discharging gas refuse only into the rivers —the attempt was not successful.

In 1861 a number of noblemen and gentlemen associated hemselves together under the name of the "Fisheries reservation Association" for the purpose of obtaining an nactment against "the poisoning and polluting of rivers," and t was due to the exertions of this body mainly that "The almon Fishery Act for England and Wales" was obtained in hat year.

The work of the Fisheries Preservation Association is still arried on, and the action of this body, on the Council of hich I have the honour to be, and whose President is one of he Vice-Presidents of this Conference, has been of great ervice in protecting streams from pollution.

I find that so late as 1892, and at my suggestion, a letter as addressed to each County Council soliciting them to ppoint sub-committees in their respective districts to take harge of the streams, and pointing out that in cases where ater flowing down was received in an impure state from the oundary which was controlled by another County Council, the ouncils thereby affected should form Watershed Boards which ould have charge of the entire water-producing area.

This would not create any new authority, and it was ggested that the united action of the County Councils could ot fail to result in securing a better preservation of the purity f our rivers.

It is interesting to note that very satisfactory replies were ceived to these recommendations, and in several instances rogress was made in the direction indicated.

I note that in 1884 and in 1892, in view of a visitation of olera, I addressed letters to all the officials of Sanitary uthorities in the Lee Watershed, asking them to be vigilant keeping detail pollutions out of the streams; this was nobly sponded to, and much pollution abated.

So, threatened evils may be blessings in disguise; why must we ever require fear as a spur "to prick the sides of o intent?" Why not be ever watching? Why earn the r proach of cowardice? It has been said and—"'Twas ev thus!"—that:—

"When the Devil was sick,
The Devil a monk would be,
But when the Devil got well,
The Devil a monk was he."

But to proceed in proper order with our historical fac In 1862 cholera appeared in China, and the fear of its reachi Europe caused public attention to be directed to the impuri to the air caused by alkali works, and to the water by riv pollution.

To use the words of a daily paper of the period, "*Asia Cholera, with all its horrors, appeared as a terrible but wholeso monitor to teach the people respect for the laws of Health, a to terrify England into the essentials of public cleanliness.*" dread was established, and for a while sanitarians were to t fore.

In 1863 the Alkali Act was passed, pollution of the atmosphe was abated to a certain extent, but no action was taken as to th purification of the water.

In 1864 and 1865 two Bills were introduced into Parliamen first, one for Scotland, and then one for England; the outcom was the appointment of two Royal Commissions, who issue comprehensive Reports. The Commissioners found that rive pollution was rampant, the beauty and usefulness of almos every stream in the kingdom was destroyed and converted fro an effectual healthful agent into a pestilential poisonous nuisance

Remedies were suggested by the Commissioners, and the also stated as their opinion that the adoption of the remedie proposed could not inflict injury upon the manufacturers, bu would actually save them from inflicting injury upon themselves

I think we may take it as a fact that there is not a singl pollution for which there is not a remedy, which, in many cases would benefit the manufacturers. If not already shown Chemical Science is sure to find out some means of purifying or cleaning effluents from factories which will be effective and remunerative; and if manufacturers ceased to discharge refuse into the sewers, the treatment of sewage at the outfall would be rendered less difficult. At present sewage, to use the words of the late Dr. Tidy, is a complex fluid, *very complex.*

A River Pollution Bill was introduced into the House o Lords in 1873—following this came objections from a section o manufacturers—but looking to the gravity of the evil, althoug the objections were fully considered by a Select Committee, the Bill passed the Upper House, and was reported to the House of Commons on 26th July, but too late for its adoption in that session of Parliament.

In 1875 another attempt was made to pass a Bill "for the better prevention of the pollution of rivers," the Bill was sent to the Commons, but never reached the Committee stage.

But in 1876 the River Pollution Prevention Act was passed, and much hope was expressed that the public would at no far distant date be freed from this "national evil."

To quote Milton :—

> " What reinforcement we may gain from hope,
> If not what resolution from despair."

No good fortune attended this Act, and it was soon evident hat while its prohibitions were distinct and decisive, enabling, ut not obligatory, powers were conferred on Sanitary Authori-ies—the very people who too often were the greatest polluters, ad to enforce the Act. Is it a wonder then that few results llowed, and the public had to look with admiration or the verse, at the "masterly inactivity" of some public bodies, on hich it is said they pride themselves, the rates are kept down, ut the rivers remain polluted.

Years pass on, and still no efficient legislation has been rived at, no effective Act of Parliament has been passed up to e present hour, although many attempts have been made, en so late as the present session of Parliament.

So great was the public feeling in this matter that a Society s formed in 1885, called "The National Society to secure fective Legislation against River Pollution." Its sole object s to induce and secure prompt and effective legislation for e suppression of the pollution of the streams and water-urses of the country. The Council was formed from Members prominent public bodies, myself amongst the number. We re fortunate in arousing much public interest, largely attended etings were held in the Mansion House of the City of ndon, by grace of the Lord Mayor, in 1885 and 1886; Bill was drafted by a distinguished member, who is a Vice-sident of this Conference, and it was introduced into Parlia-nt but did not succeed.

The Society has now ceased to exist, for it did not receive encouragement which it deserved.

At the Meeting, 10th March, 1886, the present Lord Chief stice said: "Nothing effectual will be done till the Country roused to such a pitch as to make it necessary for the

Government of the day, whatever it might be, to take the gre question in hand."

At the same time we have to remember that in many cas to drive the manufacturers to keep their refuse out of t rivers would raise the question of easements and prescripti rights, and endanger the existence of the population center in these rights.

We are thus forced into consideration of the conditio affected.

Primarily, the national health, next, the well-being of t people living on the banks of rivers, and last, not least, t effects of river pollution on the means of enjoyment a recreation of the people of this country.

I must not omit to note the passing of the Private Act the Mersey and Irwell Watersheds in 1892.

Enough, however, of history, enough of comments inefficient legislation. I dealt somewhat freely with the questi of "Fouling of Streams," in a Paper which I read at o Congress at Bolton, in the Jubilee year, 1887, and ten yea further almost daily experience has not changed my views. T remedies are mainly "*improved legislation, abolish all speci clauses or exemptions and make the fouling of streams a pen offence.*"*

In my judgment much may be done by individual action. I River Pollution no half measures must be adopted. What th country requires is a firm and sound Act of Parliament havin compulsory and not permissive powers, entrusted to competen men to carry out, administered in each water-shed by a ma who by his personal influence can induce polluters to abate the nuisances, not necessarily an autocrat, but one who knows ho to exercise the duty entrusted to him with judgment and fir ness, governed by Conservancy Boards, to legalise the acts such officials. I find that it pays to "ask" for that whic the Courts might "compel." Nothing exasperates a man mo than being served with a "notice." Such a man general consults his solicitor, who in the present state of the la usually gets his client out of his trouble, and the polluti complained of remains. We should by all means attain o object, but "if it be possible" without offence, and tact go much further and is far less expensive and more satisfactory result than proceedings in the Courts of Law.

Although on this occasion I do not purpose to say much upo remedial measures, and would rather influence discussion o such matters, I have no idea of entering upon the oft-trodden road, the Sewage Question, which will probably be dealt with in one of the sections of the Congress. I must refer in general terms to some conditions affecting our subject.

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* Vol. IX. Transactions.

There is one word which is easily understood, and which lies at the root of the mischief, it is WASTE. There is no waste in Nature; why do we not put our rivers to the purposes for which they were intended, for water supply, for national enjoyment? In China, where fish forms a considerable proportion of the food of the population, much care is taken of the purity of the rivers, no pollution by sewage is permitted, all refuse is disposed of on the land. Why are we behind the Chinese? Must the nation, who, although much below ancient Rome in sanitary matters, is at the head of the civilization of the present day, have to go to China for instruction? No sewage pollution should ever enter a stream, least of all one out of which drinking water is drawn. But, alas, the water-carried sewage of towns, in some cases protected by special clauses in Acts of Parliament, still either entirely or imperfectly purified, or escaping by our old enemy "the backdoor," so-called storm-water overflows, passes into our streams, wasting that which should produce food by manuring our soil, an operation which is now largely performed by imported fertilizers from abroad.

Some years ago an eminent agriculturist, who perhaps was in advance of the age, said that the dinner of to-day should produce the dinner of that day twelvemonth. This was practically brought out by one of our Vice-Presidents in his Presidential Address to the Meeting of the Society of Chemical Industry, of which we are both members, at the annual meeting held in Dublin in 1891.

"If properly utilised the sewage of a country, together with he organic remains, such as the bones and the blood of animals which have been killed, should provide a fresh supply of food, nough for the inhabitants of that country."

"If instead of sending excreta into the water, they were eturned to the soil, the whole of the matter taken from it to orm food would have been restored, and be available for the ew crops for man and beast."

But, again to quote from the address, "We throw away our efuse, impoverish our soil, and waste our resources by buying ubstitutes from foreign countries."

In considering the question of the purification of our rivers, e should divide the subject into two classes, *first*, the streams om which water supply is drawn, or at all events those ortions of the watercourses which are above the intakes of ny water supply; and, *secondly*, those streams from which no drinking water is drawn, or those parts which are below such intakes.

Now it is a curious fact that in the Lee Conservancy Act, 1868, which I take for the purpose of illustration—and which to quote Lord Russell of Killowen, "is an epitome of all the evils which follow the existing state of the law"—no such distinction is made, and it is implied by its special clauses that the same degree of purity which is required at Luton, almost at the river source, should obtain at Hertford, Tottenham, and West Ham, the two latter places being miles below the Water Companies' intakes.

Common sense naturally rebels against this, and I have never reported on stringent requirements at the two latter places. The sewage, according to the Act, is to be purified by "the best known practicable process." Can anyone answer the question, "What is it?"

It is much to be regretted that pollution from Hertford is legalised, an action fought by the Conservators against the Hertford Authorities in 1884 having been lost on legal grounds, and the Authorities not unnaturally stand upon their legal position.

A word now about standards of purity. My experience shows that it is a wise policy to omit them from Acts of Parliament in respect of River Pollution.

Discharges of effluent sewage, or effluents from factories, must be governed as to their condition by the volume and velocity of the streams into which such effluents have to pass, and it would be a difficult matter, indeed it would be almost an impossibility to devise a generally to be adopted standard.

I rather tend to the freedom of action of the official in charge, who, as I have before said, should be competent to decide on the matter; for my part, I always submit a doubtful case to my consulting chemist.

We must try to get rid of our sewage, at all events, at reasonable cost, but if at a loss, surely, again to quote from my friend's address, "the preservation of springs, streams, and rivers from poisonous contamination is of infinitely greater importance."

So much then for sewage; we must approach now the difficult question of pollution from trade refuse.

There is an enormous amount of waste in discharge of trade refuse into streams. Curiously enough, there is one prohibition in the Rivers Pollution Act, the discharge of ashes is forbidden; this may be well so far as silting up of streams goes, but I submit that the reasonable passage of ashes into streams has saved many a river from becoming badly polluted, indeed passing of foul effluents through ash filters has been recommended for purification.

I spoke just now of the resources of the chemist, and I cannot refrain from quoting yet once more from the address to which I have referred:—

"May we not hope that the "*Chemical Engineer*," who has already turned to value so many waste products, primarily for the good of the manufacturer, but necessarily also for the good of the country, will find some means of saving this enormous loss."

The author spoke practically as well as prophetically, for out of a discharge of soap lees, which formerly passed into, and polluted the River Lee, his firm had by abating the nuisance, and evaporating the glycerine, derived considerable profit.

I trust we may hear from other manufacturers equally satisfactory results from recovery of waste products, and so converting our waste into profit.

I have spoken of water supplies from rivers, and their protection from pollution.

We have machinery for controlling and safeguarding our water supplies, but no efficient control to safeguard its sources.

I brought this matter before the inquiry held in the City of London in 1890, as to the question of metropolitan water supply, of which Sir Guyer Hunter, our registrar, was president, and to which I was a witness; and again before the Royal Commissioners on London water in 1892, and proposed that as there is in the water department of the Local Government Board a "Water Examiner," so should there be an "Inspector of the sources of supply."

As one often finds, ideas are not born singly. The *Times* of 6th August, 1884, writing on the subject, proposes almost a like arrangement:—"The matter should be dealt with as a whole, and by an authority armed with larger powers than those which the conservators possess, not necessarily a dictator."

"An officer with ample powers, acting under the authority of the Local Government Board, who should legalise his acts, and who ought to instruct all the officials and authorities under any Act of Parliament affecting the public Health to afford him every assistance."

This recommendation has not yet borne fruit, and we prefer to cast about for new sources, rather than protect and improve those we have.

Perhaps a short sketch of my practice and the mode which I adopted on my appointment in 1871 may not be considered a useless object lesson. I shall be glad to hear others' experience.

First I impressed my Board with the fact, only too evident, tha for a long time we could only hope for amelioration of conditions and that entire abatement of pollution was out of the questio for the moment. Then came the consideration how to procee I first placarded the whole watershed, setting forth the requirements of the Act of Parliament and the penalty to be enforce for non-compliance, this was necessary to effective movement further, I established a system of correspondence over th whole area; and, in perfect confidence, I am made acquainte with everything which goes on in my special duty; beyond this I take in all the Newspapers of note in the area and an constantly visiting districts at unexpected times, try to b "unseen yet ever near," and note the most insignificant detail From the first I have set my face against prosecutions; I kno practically, and, therefore, make the recommendation herein before referred to: Ask rather than try to compel and yo stand a fair chance of success.

Looking to the question from all points of view, and we nigh in despair of obtaining such an enactment as will coinci with the views of all persons interested, why not combine a guild and endeavour to bring co-operative principles to o aid? Let the members of this league, which I propose, act up the principles which have governed the Fisheries Preservati Association, with which, indeed, it might be incorporated a vantageously. The individual subscription of membership m be small, but the aggregate amount should be large. I subm that such an association is quite possible, and if prope organized, it may meet with the success which has been r markably exhibited in other societies with different objec We all know that "sands make the mountain, moments mak the year," manufacturers, fishermen, riparian landowners, a may combine for the common good, and pure rivers—one o the delights of paradise—may be the reward.

What is this conference after all—'tis but a means to a end—but what an important *end!* Nothing less than a grea factor in the stability of this vast realm, that Empire o which the sun never sets; for has it not been truly said— "THE STRENGTH OF A NATION LIES IN THE HEALTH OF IT PEOPLE."

CONFERENCE OF MUNICIPAL REPRESENTATIVES.

ADDRESS

By Councillor B. Womersley, Chairman of the Sanitary Committee of the Leeds City Council.

President of the Conference.

For months past your visit to our City has been anticipated with great interest, and your presence affords our Sanitary Committee much pleasure; allow me in their name to tender you a hearty welcome to the City of Leeds, upon whose progress I desire to say a few words.

Leeds received its first Charter of Incorporation from Charles II. in 1661. This continued in force until the Municipal Reform Act was passed during the earlier years of the reign of Victoria.

The first Leeds Improvement Act dates back to 1755. It was termed an Act for the Enlightening of the Streets and Lanes and Regulating the Pavements of the town, the Act states that Leeds was a place of great trade and large extent with many streets, narrow lanes and alleys. Power was given to remove any nuisances or *annoyances*, which might exist in the town. After all these years, I am bound to confess we have still some nuisances left in the City.

About the time when the Queen came to the Throne the whole system of Municipal Government throughout England was reconstructed. The Corporation of Leeds was enlarged in 1835 from 36 to 64 Members, our present number.

In 1837 two very important Acts were passed as regards our City. One was for the better lighting, cleansing and sewering, the other for the better supply of water to the town. At that time Leeds was the chief seat of the woollen industry, and the largest and most populous town in Yorkshire. A position, I am glad to say, it has never lost, due greatly to its excellent facilities for water carriage by canal and river.

Its chief industries at that time were flax spinning, woollen manufactures, dyeing, chemicals, fire clay and pottery, locomotive building, machine tool making, leather industries, paper making, linen trades, iron smelting, &c. The flax t gone out—on the other hand the ready-made clothing is now one of our most important, giving employment to 30,000 persons, mostly women and girls. Boot manuf is carried on to a large extent in the City.

Such a variety of industries serves to complicate the conditions in our midst.

Allow me to rapidly review the Sanitary progress o during Her Majesty's Reign.

Population and Rateable Value.—At the commence the century our population was 53,000 with 11,600 i houses, and through the century there has been a c increase in our numbers until to-day. We have wi borders a population of 409,000 with 86,730 inhabited and every two years we add to our population a numb to that of either Harrogate, Windsor, Ossett or Durha

In passing let me just state our rateable value is £1,4 our nett debt is £4,797,540 3s. 4d., or £11 14s. 9d. per 409,000, one penny in the pound producing £6,022 16s.

Our rates in Leeds are: City, 5s. 10d. in the poun 1s. 4d. in the pound; total, 7s. 2d.

Water Supply.—A good water supply is undoubte most potent factor in promoting good sanitation. Befo the water supply of the town was most unsatisfactor derived from wells, the River Aire, and from rain water At that time it was no uncommon thing to see long working people waiting their turn at the wells. But year a Company obtained an Act of Parliament, authori supply of water from the River Wharf.

In 1852 the Water Works were transferred to the Cor In 1865 the present scheme was begun, by which the supplied with excellent soft water gathered in the valle Washburn, fifteen miles from the Town Hall.

The available daily supply of water in Leeds, is 28 gallons, the average daily consumption being over 14 while over 73 millions were supplied to neighbourin during the past year.

The daily average consumption by meter, for trade p is just over four million gallons. Thus, Leeds cannot be with having an insufficient water supply.

Open Spaces.—Another factor bearing on the healt people, is open spaces, which have been provided with a lavish hand.

Upwards of 637 acres of land have been dedicated to use of the public for ever. These are comprised in 1 parks or recreation grounds, at a cost of over a quart million of money. It costs the city £7,600 every year to maintain these open spaces. But we consider this a good investment in the interest of public health, and these places are things of Beauty, and will, it is to be hoped, remain to the Citizens a joy for ever.

In 1840 a public meeting was called by the working men of the town to promote sanitary reform, to petition the Town Council and Parliament on the subject.

The sanitary conditions amongst the poor was most wretched.

At that time a public exhibition was held, and the proceeds being devoted to the improvement of the sanitary conditions of the people, arising from—

1. Prevalence of an impure and infected atmosphere.

2. Presence of disease arising from deposits of animal and vegetable matter for want of a proper system of scavenging.

3. Great disproportion of privies to houses.

You will not be surprised to learn under such circumstances, sickness was prevalent to an alarming extent in 1840.

Fever Hospital.—Formerly there existed an Institute called the House of Recovery; it is true at times totally inadequate for dealing with the malignant epidemic fevers then very prevalent in Leeds; but from that time much has been done to check the ravages of infectious fever in our midst.

This Institution, moved from Vicar Lane in the very heart of the town to Beckill Street, was from time to time enlarged, and was taken over by the Corporation in 1885. In 1894 the Corporation secured the Manston Hall Estate, comprising 7 acres, at a cost of £10,000, situated about three miles from the centre of the town for the erection of additional accommodation.

The present Hospital will provide 136 beds for general infectious fevers and 58 for small-pox, and it is intended later to bring the total number up to 300 beds with complete administrative quarters and disinfecting station.

Undoubtedly the adoption of the notification of Diseases Act by the Council in 1894 has necessitated a great extension of hospital accommodation.

Last year over 2,300 cases were notified, of whom 726 were taken to the hospital, and I am glad to say under the wise and careful management of our Resident Medical Officer, Dr. Pearson, and the Matron, Mrs. Doran, our fever hospital has become quite popular with the people, and we have no difficulty in persuading persons suffering from infectious disease to go into hospital.

During the last five years 750 patients have annually passed through our hospital.

I trust a large number of the Members of this Congress will find it convenient to visit Manston, and see our splendid hospital grounds. And I would draw their special attention to the sixteen separate cottages built for the accommodation and isolation of families, while their own houses are undergoing disinfection.

Disposal of Sewage.—In a great inland town like Leeds the disposal of its sewage is a most serious problem. When I mention that we have running through our City upwards of 400 miles of main sewers, ranging from 9 inches to 8 ft. 9 in diameter, you will realise that there is an enormous quantity of sewage to be dealt with.

In 1870, after many experiments, the present works were erected at a cost of £47,000, our population was then 250,000.

The system adopted is that of lime precipitation, with large settling tanks, through which the sewage flows slowly, depositing as it goes.

At these works daily we are treating 16 million gallons of sewage at a yearly cost of £7,000, and the purity of the effluent is much greater than that of the River Aire before it enters the City. We feel we have outgrown the capacity of these works. The minds of our City Fathers are sorely troubled just now as to the best system to adopt to meet the growing demands of our ever increasing population, and the difficulty of dealing with certain trade effluents.

Scavenging.—Looking backward in scavenging matters in Leeds seems only to emphasise the progress made in all departments. Fifty years ago, an army of paupers swept our streets at an annual cost of £206 paid to the overseers, who complained, not without reason if they properly did their work, that the pay was inadequate. They advanced the price of pauper labour to £500 per annum, until at last the Corporation were forced to pay the guardians 6 pence per day for each pauper employed, so for twenty years our streets were cleansed by an army of 200 paupers.

But when it was first proposed to use sweeping machines a great outcry was made, on the ground that the machine would do away with pauper labour, as it was stated one machine would sweep nearly 400 miles of streets.

About this time, the day of small things, six horses were partially employed watering the whole of the streets. When an application was made for three more, it was said the poor contractor in his endeavours to meet the wishes of the ratepayers had lost four horses by over-exertion.

The cleansing of the streets passed from the pauper hands into that of the contractor, but at the present time, the

Corporation do the work with their own staff of men and horses and the results are far more satisfactory.

That difficult question of dealing with refuse has to a great extent been grappled with by the aid of four destructors, situated in various parts of the city, where all the solid and unsaleable refuse collected from the ashpits in the city, numbering 41,000, is destroyed. Annually we destroy 70,000 loads of refuse. The cost of burning, including all charges, is 2s. per ton. In that amount we allow 3d. as the cost of carting the residual clinker away. We reckon every ton of refuse costs the city 4s. 9d. to get rid of, 2s. per ton burning and 2s. 9d. per ton collecting and carting. If we had to cart the whole refuse out of the city, the cost would be much higher.

The total cost of constructing four destructors was £40,000 and the annual working expenses are £7,000. The average temperature maintained is 1,500 degrees Fahr.

Forced draught by means of steam jets are applied to each lestructor. At present the steam power is utilised in mortar grinding. It will be of interest to state that just now we have ne destructor under repair, that has been working over twenty ears.

The public hardly realise the vast quantity of refuse lealt with every year by the corporation. It cannot be less han 130,000 tons of ash refuse alone, and if this had to be emoved by rail, it would require a train of 17,000 trucks, eaching from Leeds to Manchester, a distance of forty miles.

I feel it right to point out, that the change from the old orporation to the reformed corporation, resulted in promoting onsiderable sanitary reform, but those reforms have been most arked during the last twenty-five years.

The sanitary work of this city is carried on under our xcellent friend, Dr. Cameron, at the head, with a staff of 50 nspectors and clerks, dealing with all nuisances, food, drugs, ow-sheds, canal boats, &c., and together with a staff of 650 en and 180 horses, at an annual cost of £67,678, including ewage works.

In comparison with former days the people are well protected rom health dangers. The whole department is daily waging ar with dirt, disease and death, with good results.

It is impossible, without wearying you, for me to speak of all he good work done by this department, yet more than 17,000 ouses were examined last year by our inspectors, leading to he discovery of 16,000 nuisances.

In nearly 9,000 houses all defects have been remedied. About 0,000 articles of clothing, &c., have been disinfected at our ation during the past year.

Some consider the death-rate of a city a fair criterion of its ealth conditions.

The average mortality in Leeds during the ten years—

1865 to 1875	28·4
1875 to 1885	23·7
1884 to 1895	21·1
Three years 1894-5-6	19·1

During last year we registered the extremely low rate of 18·8.

Of the nine large cities with populations exceeding a quarter of a million, only two places had a death rate last year so low as Leeds: Edinburgh, 16·9; London, 18·6; Leeds, 18·8.

This prolongation and saving of life during 1885-94 as compared with 1865-74, represents a yearly saving of over 2,800 lives, as the result of improved health conditions. Or to put it in another way, picture to yourselves our noble Victoria Hall on the occasion of some popular musical festival. The seating capacity of the floor is crowded in every part, all available space for standing is taken up. Now the impatient crowds swell up to the Orchestra until it can hold no more. Then the gallery is thronged until every seat is filled.

We will suppose for this special occasion the vestibule is utilized, and soon every inch of space is occupied by an expectant audience, and even now there remains an overflow who go off, it may be to the refreshment room to find satisfaction in lieu of a seat.

Gentlemen, that vast human audience (very few babies whose mortality raises our death-rate) barely represents our annual saving of life in Leeds, compared with thirty years ago.

Surely no money value can be put on this saving of life and the increase of human happiness that these figures disclose. I am proud to say during the last three consecutive years, the death rate has been only 19·1.

To a large degree these results, eminently valuable to Leeds, may be taken as the interest on capital expended, and the result of knowledge diffused in the application of sanitary science in many directions during the past twenty-five years.

I cannot close without referring to a most important undertaking the City Council have on hand just now, the carrying out of which is entrusted to the Sanitary Committee.

Under the Housing of the Working Classes Act, 1890, an official representation was made by our valued medical officer, Dr. Cameron, in regard to an insanitary area of 75 acres, with a population of 15,000.

The Council wisely decided to deal with such a large area in sections. Of the above, 16¼ acres are just now being dealt with under Part 1 of the Act; an order having been obtained only last year. The numbers displaced in this area will be 3,844. Accommodation had to be provided upon the cleared area for 2,000 persons of the working class.

The reason that led to this most important Sanitary improvement was the fact that in this particular area, the Mortality was 90% higher than any other district in Leeds. While the death-rate in the whole City was 20·6 for the previous three years, in this area it was 39·2.

Two Inspectors were sent down by the Local Government Board to hold a local enquiry which lasted several days, but the Bill was stoutly opposed in the House of Commons, by the owners of the 15 public houses situated in this particular area. In the House of Lords the opposition fell away somewhat, but the Bill was still opposed by the owners of 4 public houses.

When the Bill was before the House of Lords an antiquated member of that distinguished House, in the so-called interests of some property defence league, moved that our Bill be read three months hence. Now this enlightened, or otherwise Lord, admitted he did not know anything about Leeds.

Gentlemen, how much longer are large Municipalities to be subjected to grandmotherly Parliaments, on occasions of Sanitary or other improvements. Surely the representatives of the people in our City and town Councils understand far better the conditions and the requirements of their town than a few members of Parliament, promiscuously brought together. Many of these gentlemen have little knowledge or sympathy with Municipal life.

To obtain a seat in such Councils, a Councillor has often to obtain far more votes than some Members of Parliament. He is as well qualified to judge of our city requirements as an average Member of Parliament. A very unnecessary burden is placed on the Municipal Authorites in this county in having to go up to Westminster and there through the lips of professional gentlemen lay their case for some street or drainage improvement, or for authority to borrow money first before a Committee of the House of Commons and then before another Committee of the Lords, who are in no special way qualified to judge of the merits and demerits of our scheme, but who are too much liable to be influenced by permanent officials.

To my mind this is a subject that ought to engage the mind of the combined Corporation of this county. If we must have some kind of centralisation, then let us have some county authority to deal with these matters within our county limits.

And why should not the legal adviser to every Corporation be competent to lay the matters affecting his own city or before any duly authorised authority without the intervi of Queen's Counsels, however eminent. I have never he one of these gentlemen failing to take up his retaining fe have known them to fail when the case came on.

If this reform could be accomplished, thousands of p would be saved to the long suffering ratepayers of this co

In closing may I express the hope that every Mun authority represented at this Conference may experience i coming years such improved health conditions as shall life worth living in all our great cities and towns.

CONFERENCE OF MEDICAL OFFICERS OF HEALTH.

ADDRESS.

By E. C. Seaton, M.D., F.R.C.P., F.C.S.

President of the Conference.

Sanitation and Sanitary Organization; their Significance and Value in Public Health Administration.

In the first place it is my pleasant duty to welcome you to this Conference at which I have been asked to take the chair. I trust it will be an interesting meeting and one which will lead to practical results. I also take this opportunity of congratulating the chief medical officer of the Local Government Board on the well deserved honour he has recently received at the hands of Her Majesty.

Great changes have taken place during the past sixty years. Whether the progress of the future will be on similar lines no one will venture to forecast. But history shows unmistakably that there are times when we may with advantage record the meaning which is, or may be, or should be, attached to certain words in common use. Clearness of thought and meaning is one essential step in progress. One of the first desiderata therefore is to get rid of the ambiguity which is at present attached to the use of certain common expressions.

The expression Sanitation is common enough now-a-days. It may serve a useful purpose if we, who have a responsibility to the public, consider for a few minutes what the term properly connotes, and how far it is to be reckoned as one of the principal agencies in producing that sanitary betterment of which much has been said during this summer.

District cleanliness undoubtedly belongs to the sphere of sanitation. In fact the terms have been officially taken as synonymous. Quantity and quality of water supply, drainage, paving, scavenging, and the condition of the dwellings of any town or district may fairly be summed up under the description of its sanitation. If the condition of the subsoil and the regulation of the air space about dwellings are included, we are according to the word a fairly full signification. How far can these measures, which come within the scope of public administration, have assisted in reducing the rates of sickness and mortality both at home and in the Colonies? Unquestionably, to a very large extent. The zymotic group of diseases has been that first affected. Those which have been properly denominated filth diseases, viz., cholera and typhus, have been practically eliminated, and typhoid has been brought under control. But, apparently, it has not appreciably affected for good or for harm measles, whooping cough, influenza, and other zymotic diseases. Furthermore, its relation to diphtheria prevalence is obscure; and as regards small-pox there is really no satisfactory evidence at present that it has contributed in any remarkable degree to the diminution of the disease.

The absence of alarming epidemics of cholera and typhus affords a striking illustration of the benefit of sanitation, guided and assisted by sanitary organization. It is, moreover, significant of much deeper and wider effects. In the reduction of pulmonary consumption, consequent on the improvement of dwellings (in respect of airiness, dryness, and cleanliness), we have the best evidence of the great value of Sanitation. Indeed, in England the diminished prevalence of this disabling form of sickness must in large measure be credited to this department of municipal administration.

With these limitations we may claim that among the chief glories of the Victorian Era is the enormous advance made in sanitation in England. We are apt to associate this advance in civilization with a few names which have become household words among those who attend Congresses of this kind. But far too little is thought of the work of the Local Sanitary Authorities, Municipalities, and Boards, especially those who have been in the van and who have had the raising and ordering of vast sums of money for the promotion of works, which for the most part form a legitimate source of pride and satisfaction. To those influential persons, Chairmen of Councils, Corporations, and Members of Committees, who promote these works with purely unselfish aims, and solely for the advantage of the public health, the highest honours are due. It has been my privilege to be associated in various capacities with gentlemen of this sort, to whom, at a similar meeting eleven years ago at York, I had the pleasure to offer a profound tribute of respect.

In the record of achievements during the Queen's reign reference was made to the hundreds of millions sterling which have been spent in this country alone in works of sanitation. No doubt there is urgent need for even further expenditure, for there are not a few backward authorities who, notwithstanding the excess of preventable disease which their returns exhibit, will remain inactive until some sort of compulsion is brought to bear. I propose to refer to this point again as part of the whole question of sanitary compulsion.

In connection with the benefits of sanitation we may concede that greater attention to "district cleanliness" by the representatives of the people must have furnished a great stimulus to improved personal and domestic cleanliness, and that in various ways public and private effort acted and reacted on each other. So that the habits and character of the people must to a certain extent be included in the connotation of the term, the significance of which we are now discussing; for it is certain that in increasing the comfort of living they have materially helped to preserve health. But needless to say there are other habits (excesses of various kinds) which cannot be brought into the same category. Again the improvement of the health of the masses of the people must in a large measure have been due to political movements snch as that which led to cheaper and more wholesome food supplies, the reduction of hours and improved conditions of factory labour. So that sanitary betterment, as it has been called, is the product of several co-operating factors. Furthermore, it is plain that a great deal has been due, not to sanitation, but rather to sanitary organization, that is to sanitary regulations directed by efficient local government rather than to district cleanliness.*

SANITARY ORGANIZATION.

If it is taken for granted that in the above term we include the medical element which is essential to its existence, we may confidently assert that it has been the motive power and the controlling influence of sanitation to which the credit of its influence and action has been generally ascribed. Whenever sanitation has been promoted indiscriminately and without the advantage of medical direction, it has been rudely checked. In the days of Mead, the recommendation of sanitation was received because it came from those who knew the habits of the plague, and who could speak with the knowledge of professional men who personally directed the treatment and care of the sick. A century later under the regime of the General Board of Health, measures failed for want of that knowledge which alone can satisfactorily explain the reasons for incurring expenditure and for altering a state of things which has long been in existence. Contrast the condition of things during the cholera epidemic in 1849 with that under which cholera was successfully controlled in 1893, and we have a good illustration of what efficient sanitary organization can achieve in a country which, though in advance of others, is still far from perfect in its sanitation.

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* The concern of the medical profession in sanitation was, at the outset, that of arousing public attention to its importance and explaining the conditions which made its neglect dangerous. The results of this pioneer work, like that which is constantly being carried out in the medical societies at the present day, were freely given in accordance with the traditions of the profession. Subsequently its relation became more direct, and this class of unofficial but public service ceased to be unremunerated. Just half a century ago Duncan was appointed Medical Officer of Health for Liverpool. Similar appointments were made in London and one or two other centres. Then the office became general throughout England in 1872. But it should be noted that it was as *one* of the circumstances affecting or threatening to affect the public health that neglect of sanitation came to be a matter of immediate official concern to the medical profession. In this respect, as well as in other ways, Medical Officers were placed in positions of trust and responsibility to the *population of a district*. We need not discuss the conditions under which the positions have sometimes had to be sustained. But as bearing on our present subject it deserves to be specially remarked that among the solid advantages accruing to the public in the administration of health matters during the past twenty-five years has been the direction of sanitation by professional men, who were able to estimate its real value and necessity, and who at the same time were absolutely independent of any commercial interest in its promotion. The importance of this consideration will be obvious to

The prevention of small-pox has been so much discussed of late, that reference to it might well be omitted on this occasion were it possible. Recognizing, as we all do, the protective power of vaccination for children, we must rank systematic vaccination of infants among the most essential part of sanitary organization. Moderate compulsion as regards parents has been found necessary for this.

The central part of the vaccination Commissioner's Report last year is that which deals with the change of age incidence in small-pox fatality, which has been so remarkable, and which has been graphically represented by our colleague, Arthur Newsholme. The conclusion to which this evidence points is quite irresistible. When the Gloucester epidemic last year was at its height, I visited the place in order to see for myself the so-called isolation hospital provision, which was said in the public prints to have proved a failure. Incidentally I had the opportunity of noting what a very large proportion of the sufferers in the small-pox huts or sheds were young children.

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practised administrators. There are not only recalcitrants and obstinate opponents of sanitation to be reckoned with, but there are those who counsel perfection. Such are apt to over estimate sanitation, and their enthusiasm may sometimes be a source of embarrassment to authorities who have to do their best for their town or district. Sanitation systems soon become superseded and out of date in these times. But the question for Authorities is not always whether they are capable of improvement by the light of present-day knowledge, but whether from an impartial point of view of the whole circumstances, and especially in regard of other administrative provision which has to be made for the protection and improvement of the public health, the expenditure necessitated by changes of system is advisable. Here also the independent judgment of experienced professional medical officers may be distinctly valuable to the authorities and the ratepayers.

In the discussion which took place at the Society of Medical Officers of Health this year upon this epidemic, the conclusion arrived at was that systematic vaccination is an indispensable safeguard to the community.

The reports of the Vaccination Commissioners refer to sanitary organization, but do not sufficiently explain what it should comprise.

One of the most vital points in the system of sanitary organization is the proper constitution of the office of Health Officer. That officer must, to a certain extent, be the representative of the medical profession, which is itself an organized preventive force, upon whose high sense of honour and public spirit, the success of preventive measures chiefly depend. With such a vigilance system, with ambulance arrangements, and with available means of early hospital isolation of initial cases, disinfection, &c., a well vaccinated town or district may be said to be thoroughly equipped in respect of small-pox prevention.

Is the town population of England sufficiently protected at the present day? Certainly not. In the first place a clear understanding is necessary as to the position a Medical Officer of Health should have in sanitary organization.

The intentions of the office are or were that he should fulfil a dual function. As an expert he is an "assistant" properly speaking of the authority, in his other capacity he is a public servant holding a position of responsibility to the community for whom he is the Medical Officer of Health, an office in which he should be as amply protected as any public servant entrusted with the highest duties in connection with the administration of the Law. The actual conditions of things is testified to by the fact that the main body of medical officers feels called upon to protest against the injustice to them, arising from their insecurity of tenure. Admitting that to some extent the responsibility rests with those who are and have been too willing to accept, and even to compete for, office without any proper stipulations, we may yet ask is there no authority whose business it is to take up the question of sanitary organization.

This subject has to be regarded from the educational as well as an official point of view. The General Medical Council of Great Britain and Ireland has concentrated its efforts on securing a fairly high standard of examination, so that at the present day the D.P.H. is regarded as an academic distinction. The number who have passed this examination during three years is given in the table on p. 344, from which it will be seen that the number who have thus qualified themselves according to a fairly high standard are in proportion to the appointments of professional Medical Officers of Health as about fifteen to one. Probably most of those who obtain the qualifications only intend to combine them with successful general practice. This which is still the prevailing system apparently grows in favour with the medical profession.*

The Medical Council and the Universities have been desirous of making it a condition for the diploma that the candidates should furnish proof of having actually had six months' experience in the details and practical working of sanitary organization, besides six months of special laboratory training. Now, if we take £1,000 as representing the outlay required for each individual who becomes qualified for ordinary practice under the present regime (five years' curriculum) an additional sum of £250, at least, would be required for the D.P.H. So that six years' of preparation and a sum of £1,250 would represent the outlay required for an individual who elected to start as a professional Medical Officer of Health. The conditions and examination may be made even more exacting, especially as regards pupilage or apprenticeship in the work we are now discussing. But surely before any further step is taken in that direction the time has arrived when the Medical Council may with advantage have their attention drawn to the present and prospective condition of sanitary organization.

Let it not be supposed that the utility of good organization would be confined to what has been briefly referred to on this occasion. There is abundant scope for other work on similar lines. For example, in the prevention of tuberculous diseases there is probably even greater opportunity for the development of sanitary organization than in those of the zymotic class both in the supervision of food supplies and the regulation of tenement houses and the occupation of cottages rural and urban.

In this place I may refer to a thoughtful contribution by our colleague, Alfred Ashby, of Reading, on the relation of the Public Health Service to Pulmonary Consumption. After giving a most able and interesting account of the laboratory experiments on which our belief of the transmissibility of tuberculosis by food supplies is based, he insists on the need for strong measures in order to reduce tuberculosis among our food animals to a minimum. But, as a preliminary measure, we must furnish proof derived from etiological studies of cases, or groups of cases, of phthisis or tabes mesenterica of the mischief which may be caused. Without this we can hardly expect to create sufficient public opinion to render efficient measures at all practicable. Here, it would seem, is a favourable opportunity for an extension of the principles of the Notification Act. Those principles have on the whole been found to be unobjectionable. One of the chief benefits conferred by the Act is the opportunity for observing the relation of disease prevalence to food or water supplies. Excellent examples of the practical results of this system are afforded by the observations and reports of Shirley Murphy and Arthur Newsholme and others on Typhoid in relation to drinking water supplies and the eating of uncooked contaminated shell-fish. In these matters the whole medical profession constitutes part of the public health service. The cost of securing the valuable co-operation of medical practitioners to this limited extent has been trifling when compared with the work of sanitation. The annual expense of working the whole notification system in England is less than what it often costs to drain a single village. An extension of this principle, by suitably remunerating members of the profession for the sacrifice of time involved by such collective investigation, and the careful preparation of reports in the manner suggested, would, I think, make a valuable advance in our systems of sanitary organisation.

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* The system apparently grows in favour with the medical profession for reasons of expediency, there being in the vast majority of cases no alternative offered by existing machinery of Government. But it must not be forgotten that the recognised organs of public opinion, viz., *The Lancet* and *The British Medical Journal*, long ago proclaimed with no uncertain note what is desirable as a matter of *public policy*.

There are, of course, many other directions equally important, which will no doubt occur to you, in which immediately good results could be produced by the employment or extension of existing systems.

There are several considerations relating to our present subject, organization, from a practical point of view which I cannot even touch on in this brief address. It would be specially interesting at the present moment in regard of the recent address in Public Medicine by Dr. Herman M. Biggs at Montreal to contrast the possibilities in achievement of sanitary organization in England and America. But such a comparison would necessitate consideration of two systems of government essentially different in respect of health administration. Before, however, concluding, a few words may be said on the question of sanitary compulsion. It is obvious that without some sort of compulsion in public health matters improvement in the past would have been much less marked, and that if it is to be maintained, compulsory powers must be increased rather than diminished. Reference has been made to the necessity for powers which will force certain sanitary (?) or insanitary authorities who are callous to public opinion, to proceed with necessary works of sanitation. In the matter of river pollution such powers have indeed already been conferred on the Thames Conservancy Board. If well directed they may do much good. Elsewhere powers of a similar or analogous kind are urgently called for. For example, drainage of houses, villages, encampments, and towns *into* the Chalk, Greensand, or other water-bearing strata without any precaution is a dangerous practice which should be stopped by law.

Again: In the matter of house sanitation, although an immense amount has been accomplished, especially in large towns, by the operation of clauses of the Public Health and other Acts relating to Nuisances, it is well to remember that the benefits of the Acts have been chiefly confined to houses of the artizan class let at weekly rents. Elsewhere improvement has been largely due to voluntary effort and a spirit of emulation, and is, generally speaking, of a spasmodic and irregular kind. Some advances have been made by means of local Acts, as at Eastbourne, and there the *vis a tergo* of indirectly compulsory powers to have the drains of a house let on lease, "put in order," as the phrase goes, was supplemented by a system of certification of houses by the Corporation, which in the case of health resorts may work advantageously to all parties. But what seems generally wanted at the present day is more equal treatment of houses of all classes. If the law operates in such a manner that an owner of small houses let at weekly rents is practically compelled to fall in with a certain standard of sanitary requirements, why should the owner of larger houses, let on lease, frequently be subject to little or no interference from the Public Authorities?

In considering the question of sanitary compulsion it is always useful to keep well to the front the principles of legislation so far as they relate to food which is adulterated or which is deemed to be unwholesome. There the offender is treated, comparatively-speaking, severely. The way in which an offence is regarded must of course always depend on the state of *public knowledge*. The state of *public knowledge* in health matters is very different now to what it was twenty years ago, when the Public Health Act came into operation. Therefore it may well be argued that as injury or danger to public health is the reason for punishment or compulsion in *all* cases some more just and equal treatment is required now for the numerous offences which are or may be brought within the purview of the law.

Most of the "powers" of authorities, though nominally compulsory are virtually permissive. The councils *may* do this; the justices *may* do that. In many instances the application of the very moderate powers of indirect compulsion depend on the executive which may as we have seen be rendered practically inoperative. Believing in the principles of local self-government in the main, I think that it is by increasing the powers of councils which are representative of wide areas and interests that advance must be looked for. The excellent and economical management of some of our large English counties and cities in health matters is an object lesson to be studied.

In close connection with the question of compulsion comes the relation of sanitary science to administration. Sanitary science comprises a knowledge of several sciences, Clinical medicine, Epidemiology, Etiology, Bacteriology, Physics, and Chemistry, all of which are concerned in questions or problems relating to public health. An accomplished medical officer must know enough to be able to correctly appreciate the bearings of any of these branches of scientific knowledge on the practical work of maintaining and improving the public health. This is not pure science, which, strictly speaking, consists in the advancement of knowledge. But it is a highly useful adaptation of scientific knowledge, together with an application of the faculty of impartial criticism. The medical assistant of a sanitary authority has not only to acquaint the authority with the meaning of new discoveries as to channels of disease, &c., but to appreciate and explain to them their true import, that is to say the proportion such a discovery bears in the field of general observation. The man of science must be constantly advancing knowledge. It is necessary that he should keep his confrères informed by means of papers and communications on the subject of his work, and respecting different stages of discovery. New facts are thus revealed before the time has arrived for generalization. Such communications now-a-days cannot be confined to experts. Frequently, as we know they are treated as subjects for popular discussion, and may be used as arguments against almost any form of sanitary compulsion.

Now one of the principal functions of a sound system of sanitary organisation should be both to promote the advancement of knowledge and to keep the public informed of the bearings of new observations as affecting practical questions of administration. For this purpose it is eminently desirable that central and local systems of administration should co-operate, and that all who contribute to the improvement and successful working of sanitary organisation should be fairly considered.

If by means of this Conference a clearer and better understanding should be arrived at on subjects which are now recognised to be of great social importance, I feel sure you will agree that it has not been one of the least useful of the pleasant meetings inaugurated by the Sanitary Institute.

DIPLOMAS IN SANITARY SCIENCE, PUBLIC HEALTH, &C.

	1893.				1894.				1895.			
	Part I.		Part II.		Part I.		Part II.		Part I.		Part II.	
Royal College of Physicians and Surgeons, London.	12	38	26	32	21	35	19	26	18	26	21	28
University of Oxford	...	...	...	...	...	...	...	...	...	...	1	4
University of Cambridge	15	55	21	58	12	39	10	33	6	35	11	31
University of Durham	...	...	...	2	...	...	3	4	...	...	6	8
University of London	...	...	...	4	...	...	2	5	...	...	...	2
Victoria University	2	4	1	3	4	7	3	9	1	4	1	2
Triple Board of Scotland	1	6	...	6	2	2	2	2	5	5	1	4
University of Edinburgh	3	10	7	15	...	8	3	8	1	4	1	4
University of Aberdeen	...	...	2	3	...	...	1	6	...	...	...	1
University of Glasgow	...	...	...	...	...	...	...	...	...	...	...	...
Royal College of Physicians and Surgeons, Dublin.	...	...	...	7	...	...	1	1	...	8	...	8
University of Dublin	...	...	1	2	...	...	2	...	...	...	...	2
Royal University of Ireland	...	...	...	...	...	...	...	...	...	...	...	...
	33	113	58	132*	39	91	46	94*	31	82	42	94*

* This number represents the Diplomas and Degrees granted in each year.

CONFERENCE OF MUNICIPAL AND COUNTY ENGINEERS.

ADDRESS

By Thos. Hewson, M.Inst.C.E., Engineer to the City of Leeds.

I am sure you, with me, will thank the Sanitary Institute for the opportunity they have afforded us of participating in their 16th Congress; and not only for this, but for their having made arrangements for us to hold a Conference here to-day on such subjects as we may feel are imperfectly or in-uniformly dealt with, or in regard to which we may have acquired new or wider experience.

These subjects, unfortunately, are far too many, and the time at our disposal far too short to do anything more than hear and discuss the papers which gentlemen have been good enough to give us their experience and ideas upon in printed form.

These are, as you are aware :—

1st, "The Royal Baths at Harrogate"; 2nd, "Sanitary Aspects of Wood Paving"; 3rd, "The Disadvantages and Dangers of Combined Drainage."

These subjects are very well worth our consideration, particularly as we are to have given us not unfounded theories but the result of practical work.

Looking at the success of these Conferences as seen by the number of those attending, I am sure they will be permanent and therefore the larger subjects of *Water Supply* (construction —available storm water—distribution—waste); *Sewerage Works* (dimensions—ventilations—disinfection); *Scavenging* (daily or continuous collection of street refuse in crowded carriage ways —collection of house refuse, day *v.* night—total abolition of ashpit); *Road Making; Street and Building Regulations; Street Widenings; Abattoirs; Hospital Construction; Public Parks* (landscape gardening — open spaces — recreation grounds); *Laying out Insanitary Areas; Cemeteries;* and many other subjects will be greatly benefitted by being discussed at meetings such as these.

No doubt owing very largely to the influence of Sanitary Institutes and kindred societies, higher aspirations in sanitary matters now obtain with the public than did formerly.

It is to the interest of the health and lives of the public that these aspirations should not only be satisfied, but their further growth encouraged.

This can only be done successfully by our being ever ready with up-to-date knowledge; and there is no possible way of gaining that knowledge better than that afforded by such Conferences as these, where opinions are freely exchanged, and all recently acquired information made public.

Whilst giving this very valuable aid, these Conferences at the same time give to their attendants the breadth of view and courage naturally due to the experience of a whole country instead of that of an individual.

Such a result can only be beneficial to Local Authorities, and amongst many other things, will surely lead to the abandonment of the system of palliation, and to their making provisions in their work not simply for the near, but for the distant future; indeed in some cases of Sewerage works, for all time.

My duty here, is not to occupy the short time at our disposal, but to devote it to the printed papers submitted for our consideration.

The paper on the "Harrogate Baths" will be appreciated at least by the North of England engineers, for undoubtedly large towns not having medicinal waters, will before long be called upon to provide winter gardens and other large buildings for public entertainments and social gatherings, when the up-to-date provision of the Harrogate Baths, Rooms, and grounds, will be most useful as a guide. The Leeds Corporation at the last Council meeting instructed its Parliamentary Committee to include in its next Bill in Parliament a power to erect such a building, although we in Leeds have a large room in the Town Hall as well as in other buildings. These however do not supply the new want; public winter gardens, public music halls, these are the newest wants.

Undoubtedly, the Sanitary aspects of wood paving should be promptly considered by Local Authorities, as that mode of construction is now rapidly increasing, and if, as I believe, there is a nuisance from horse droppings in the larger cities where the paving consists of granite, and that, too, notwithstanding it may be daily scavenged, everyone must see how necessary it is not to make that nuisance greater by the use of a softer road material, and that if a softer road material must be used, special means to prevent nuisance should be adopted.

Some of these will no doubt be suggested by the writer of the paper and it is to be hoped practical application will result, for I am sure this nuisance is so under estimated, that it requires the object lesson given the other day, of an American attending the Jubilee celebration in London, shortening his stay there, because he wanted to get the stable smell out of his nose.

CONFERENCE OF SANITARY INSPECTORS.

ADDRESS

By Peter Fyfe, F.R.S.Edin., Chief Sanitary Inspector, Glasgow.

It is very gratifying to me to be present here among my brother Inspectors, and the honour you have conferred upon me by selecting me as President for the purpose of this Conference is one which will be cherished by me as long as I live. I know full well that my humble services in the sanitary field cannot claim any such honour, but I accepted the position so graciously offered me by the Council of the Sanitary Institute as a token of the Institute's good-will towards Scotch Inspectors, and as an earnest of their desire to unite under one banner all the labourers of the United Kingdom whose aim and work are to bring health to every citizen.

We have also to thank the Council of the Institute for their recognition on this occasion of the unanimous desire of the Sanitary Inspectors of this country to have their Conference directed by a Chairman who, being one of themselves, may be presumed to interpret their views and aspirations. My first words to-day may well be to assure the Council of the Institute that their confidence in Inspectors will in the future be justified, and produce in the mind of every man of us the feeling of free loyalty to its Council, which must always spring from a generous recognition of your just privileges and legitimate desires.

A presidential address is not unseldom a resumé of the past. In this Jubilee year I do not intend to go much into past history. I think we may say to the dead past "Bury your dead." The rottenness, misery, and squalor of thirty years ago —the remembrance of past years of high mortality, those years of the slow evolution of the Sanitary Inspector, plodding ignorant in the mirky dark with no Sanitary Institute to guide him, may, I judge, be put aside in this year of 1897. I would not trouble you by taking long backward glances into those dismal periods of the Sanitary Commission and the heroic Sir Edwin Chadwick. We all know and revere these men and their grand efforts. We all humbly recognise our deep indebtedness to those preachers who fifty years ago thundered forth the gospel of cleanliness. We stand here to-day, men evolved through the preaching of that gospel, and seem to hear their voices as from the grave whispering to us "Do not cry out —see what a stride we have taken—but look out and see what disease is still in life, proclaim it aloud and work as we wrought, day and night, for its amelioration and cure." I will therefore invite you to-day to look principally ahead, forgetting the past, and try to find those who, even in this enlightened year, are still waiting for succour from the practical sanitarian. We need not vex ourselves or our legislators about infectious diseases, offensive nuisances, impure water, or unwholesome food. Those powers of evil are in the main provided against or are in process of being conquered. Our law-givers have sharpened our weapons against such classes of sanitary troubles, and we or our masters, the Local Authorities, are to blame if such enemies to life and vitality are allowed to prevail. We need no longer bewail the want of power over the grosser sanitary offences, but we have still to sorrow over our weakness to cope with some unwholesome conditions, and especially those operating adversely to health and comfort in our cities, and larger towns.

The domicile has occupied much of your attention hitherto. In the homes of the people your voices have been raised, and your daily effort directed to procure for your fellows the maximum of immunity from discomfort and disease. To make every home a sweet home has been your constant labour. You have combined with every class of sanitarians to cry out against the greed and rapacity of jerry-builders, and the indifference and perversity of slum-property owners. Both law and public sentiment are now ranged on your side, and large sums of money are now spent yearly both by Corporations and proprietors in the endeavour to atone for past transgressions. The purely infectious diseases do not ravage our populations as of yore. Pestilent effluvia, from garbage-littered courts, leaking drains, cesspools, and inefficient traps, are things of the past wherever inspection is efficiently made. Overcrowding, and its hideous gorgons, the typhus and bubonic plagues, are being steadily abolished from our land, but the Medusa of modern life, namely, phthisis, is still awaiting the arrival of that great legislative Perseus whom every ardent sanitarian is looking and longing for.

At the dawn of this century when combined capital and mechanical invention began to produce an industrial crisis in England, when the press of that time drew public attention to the terrible and slave-driven condition of the cotton operatives, Sir Robert Peel, in 1802, drew his first Bill against the iniquitous destruction of youthful life in factories during that period. He was the Perseus of that sad time, who, himself a manufacturer, turned the curved sword of his just vengeance against his brethern who were gorging themselves with gain regardless of the cost in human life. From then up to the present day there has been a succession of Acts of Parliament for ameliorating the condition of the workers in factories and workshops. The latest Act of 1895, placing as it does the sanitation of our industrial hives in the hands of Local Authorities, marks a sensible advance, yet it throws the Local Authorities back upon the powers contained in the Public Health Acts and leaves them impotent to enforce valuable sanitary provisions contained in the Factory and Workshop Acts themselves. One of these valuable provisions I wish to refer to particularly in view of the known prevalence of phthisis and other diseases of the respiratory organs among factory and workshop operatives. It is that which affects the efficient ventilation of such places. Experience and statistics have abundantly proved that workshop life is accountable for the prevalence of consumption to a very great extent. Just double the number of employees in such places die from this disease compared with those who succumb to it who work in the open air. Now there are three out-standing agencies which cause this extra destruction to life. The first is the mixing with the respirable air of dust or particules engendered by the particular trade process; the second is the amalgamation of gases, vapours, or excessive moisture with the atmosphere inhaled by the workers; and the third is the impurity of the air breathed as the result of atmosphere stagnation.

There are important provisions as to sufficient ventilation both in laundries and in factories and workshops in Sec. 22 and 23 of the Factory and Workshop Act, 1895, but their use is placed out of the power of Local Authorities to exercise and is entirely in the hands of H.M. Inspectors of Factories. Those gentlemen, capable as they are, are few in number compared with the army at the command of town and county councils. They cannot be so intimately acquainted with thousands of small factories and workshops, where the ventilation is rarely effective, as are the Local Authorities' Inspectors. As the trend of recent sanitary legislation has been to devolute upon Local Authorities more and more responsibility for all insanitary conditions, I feel satisfied that time will bring these powers within our reach. What, in the briefest words, are the powers referred to? They are the compulsory provision of mechanical power for the special purpose of ventilation in power-laundries, and in all factories and workshops where any dust, gas, vapour, or other impurity is generated and inhaled by the workers to an injurious extent. Unfortunately for the operatives all such impurities must be *the result of the trade process.* We all know that one of the most objectionable impurities, and perhaps the most insidiously dangerous, is the constantly evolving impurity from man himself, but no mechanical ventilation can be enforced for this kind of impurity, notwithstanding the fact that in our cold climate natural means of ventilation in such places are impracticable because of dangerous draughts of chill air.

Let us examine the sanitary provisions of the Act for protecting our workers from the danger of rebreathing already expired air. These are contained in Sec. 1 of the Act of 1895, where for the first time a figure has been put upon what the legislature mean by overcrowding in workshops. The figure is 250 cubic feet of space per person during ordinary working hours, and 400 cubic feet per person during overtime. Here, then, we have a basis to start from, and I desire to draw an actual picture and tell what kind of air was found in a workroom filled with employees up to the 400 cubic feet or overtime standard, with no other means of ventilation than what can be obtained by the so-called "natural" methods of windows and doors.

I take the most favorable time for natural ventilation, namely, an afternoon on the 13th of August, 1897. The hall was one specially built for tailors, with a high peaked ceiling and open rafters. Plenty of large sky-light windows are fitted on each slope of the roof for cross ventilation and these were open, as the day was warm, the temperature inside being 65° Fahr. The total space is 13,761 cubic feet, and ranged on the floor are 34 men busy plying the needle with apparently abundance of floor space for work. No appearance, to the eye, of overcrowding, and a cubic space for each tailor 62 per cent. higher than the Government standard. Notwithstanding all this, the air is stuffy, and I took a sample of it at 4.20 p.m. which I submitted to one of Glasgow's public analysts, Mr. R. R. Tatlock, who certified that it contained sixteen volumes of carbonic acid in each 10,000 volumes of air.

Another sample taken on the same afternoon in a room having 12,623 cubic feet of air space, and occupied by fifty young girls, was certified by the same well-known chemical authority to contain 12 volumes of carbonic acid per 10,000.

If such excesses of carbonic acid are found in workrooms at and much above the legal standard of occupancy in summer time when the windows are open, you can imagine the winter condition of such rooms occupied up to the standard.

Passing from this practical view, let me give you a theoretical picture of the atmosphere of a workshop for girls, and draw a deduction.

The time is winter, and the tenement factory is a large hall or room 40 feet long by 25 feet wide by 10 feet high. In this hall 40 girls are employed mostly at the sewing-machines. The floor space for each employee, along with her machine, is 25 square feet, or 5 feet by 5 feet. Now, every known authority admits that for the maintenance of good health not less than 3,000 cubic feet of fresh air are required for each adult to keep the effete products of respiration from rising higher than is indexed by the presence of 6 volumes of carbonic acid in 10,000 volumes of air. For this purpose 120,000 cubic feet of pure air require to be passed into this room each hour; or, in other words, the whole air of the room must be renewed twelve times in the hour for reasonable healthy existence. Not one-half of this quantity could be safely admitted from the outside atmosphere, even assuming that there were such mechanical appliances as would force in or extract 60,000 cubic feet of air per hour. We are therefore at present in this situation, that while compelled to admit the stuffy and unwholesome atmosphere of thousands of small factories and workshops we can do nothing by process of law to help the sufferers from an impure atmosphere unless, as I said before, the impurities arise from the trade process. That these girls will suffer after the first hour, even presuming each gets 1,500 cubic feet of fresh air supplied to her per hour, is obvious, because as each of them exhales six-tenths of a cubic foot of carbonic acid per hour, and is presumed to receive 1,500 cubic feet of fresh air in the same time, by dividing the former by the latter we find her at the end of first hour in the midst of air containing eight volumes per 10,000 of carbonic acid instead of the safe allowable limit of 6 per 10,000. But it must be stated that many thousands of workshop employees are in a worse plight than is here indicated. With natural ventilation, and at the Government limit of 250 cubic feet of air space each, they cannot possibly get more than a fourth of what is required without sustaining the sensation of a continuous draught. Assuming they get a fourth of the scientific minimum, this brings the vitiation of the air up to 6 volumes of carbonic acid in each 10,000 volumes of air, which, added to the 4 volumes generally present in natural air, makes a total of 10 olumes of the index of impurity instead of 6, the scientific aximum.

I have gone somewhat into detail here, as I consider the Government limit of 250 cubic feet of air space per head, one which in our climate renders healthy factory and workshop life an impossibility. It is true that Section 32, of the Factory and Workshop Act, of 1895, states that "In every factory or workshop adequate measures shall be taken for securing and maintaining a reasonable temperature in each room in which any person is employed."

This looks, and, as a matter of fact, is a most necessary and desirable stipulation, but it is of little value in the face of the 250 cubic feet limit just referred to. In three hours, a person in that limited space becomes himself a very effective stove when the ventilation is defective. Without ventilation his respirations alone in that period would raise the temperature of his 250 cubic feet of air, from 54° Fahr. to 63°. In other words, where there is no induced current of air, as we find in almost all workrooms in Winter, the bodies and the breath of the workers form a means of raising warmth, and, in the words of the 32nd Section, of "maintaining a reasonable temperature." I do not think for a moment that this dubious means of warming was in the mind of the Government which passed this measure. I maintain that this section is valueless in cold weather, unless power is also given to ventilate all factories and workrooms with warmed air by means of suitable mechanism. It is also a serious question whether the very best mechanical appliances would be of value unless the amount of free air space given to each employee, is considerably increased from 250 cubic feet. Natural ventilation on the 250 cubic feet limit, must mean bad or vitiated air, and for the workers, after a time, feelings of oppression and impaired vitality. It does not require much observation to note in many workshop hands the pallor and look of lassitude which is the effect of working in close and stuffy rooms. These predisposed to consumption, bronchial affections, and anæmia cannot for long withstand the daily overdose of carbonic acid and organic pollution given to them in the average workroom.

Gentlemen, we cannot say in these days, as Thomas Carlyle said in 1843, that "in no time since the beginning of society was the lot of those same dumb millions of toilers so entirely unbearable as it is even in the days now passing over us." Much has been done for the working bees in the great hive of Britain since then, but the remainder of the old philosopher's appeal has still an echo in our present day. "It is not," he cries, "to die, or even to die of hunger that makes a man wretched; many men have died, all men must die, the last exit of us all is in a fire chariot of pain, but it is to live miserable we know not why, to work sore and yet gain nothing, to be isolated, unrelated, girt in with a cold universal *laissez faire*; it is to die slowly all our life long, imprisoned in a deaf, dead, infinite injustice as in the accursed belly of a Phalaris bull. This is and remains for ever intolerable to all men whom God has made."

Gentlemen, it is not belly-hunger we have now to fear for our printers, tailors, seamstresses, hemmers, and thousands of indoor workers of all kinds; it is a lung-hunger, an air starvation that in these days makes many a life weary and intolerable. Is it not strange that at this hour when mechanical motors, Blackman air propellers, and other mechanical contrivances by the hundred are at hand so efficient and yet so moderate in cost, a single city factory or work-room should be imperfectly ventilated; that in times when standards of purity in food and house accommodation are receiving the close attention of the House of Commons, the standard of purity in work-room air is left unnoticed, or, at any rate is presumed to be solved by Section I of the Factory and Workshop Act of 1895, *plus* the general power given under the Public Health Acts as to defective ventilation? I think I have shown it can never be so solved, and that until a Government fiat goes forth as to the maximum impurity which shall be allowed in all work-rooms, the slow poisoning indicated by the presence of over 10 volumes of carbonic acid in 10,000 volumes of air must proceed unchecked and unabated.

I was glad to observe in the "Sanitary Inspector's Journal" for July last an excellent address on the subject of ventilation by the Chief Inspector of Bristol. He could not have presented for discussion a better subject, nor one in which lies mightier possibilities for raising our masses into happiness and health. Only in one important point would I venture to express myself as a dissentient from his views. The point, however, is a vital one and should be thoroughly discussed until a proximate unanimity among Sanitary Inspectors has been found. I refer to that passage where he says "I am of opinion that the heating of buildings should be distinct from the air supply." This dictum appears to me to be against every modern canon of ventilation. Nothing would, in my opinion, militate more against the successful ventilation of factories and workshops than such a dictum. On the contrary, my experiences lead me to the conclusion arrived at by Dr. Parkes and De Chaumont in their text book on "Practical Hygiene," viz.:—"That any greater speed of incoming air than 3½ ft. per second will give the sensation of draught, especially if the entering air be of a different temperature from that of the air of the room or apartment."

They go on to say "If the air be about 70° Fahr., a rather greater velocity than this is not perceived. . . . . If the air could be warmed to a certain point in a cold climate, or if the climate be warm, there may be a much more rapid current and consequently a smaller cubic space might be given. *The subject of ventilation is, in cold climates, connected inseparably with that of warmth, for it is impossible to have efficient ventilation in cold weather without warming the air.*" Such are Dr. Parkes' and De Chaumont's views. Let us remember them in our daily practice.

There are vast possibilities for good in the study of this subject, and having directed your attention to one of the paths whereon the practical sanitarian may find on every side beneficient work still waiting to be done, I would, before closing, take a general and brief survey of our own position as official sanitarians, and try and indicate how best we may without fear or favour face the many duties and responsibilities resting upon us.

There are three outstanding needs of this present time so far as Sanitary Inspectors are concerned.

The first is a systematic and high-class course of instruction and examination recognised by the laws of the three Kingdoms.

The second is an equitable scheme of union, close and indissoluble, between every Sanitary Inspectors' Association.

The third is a legalised basis upon which every Inspector may feel absolutely secure, both as to the tenure of his office and the comfort of his old age.

We are to hear some words of enlightenment upon this last important subject from my friend, Mr. Lindsay, of Mid-Lothian, so I will not trench on the subject, except to state that any scheme of superannuation should be general in its scope and not confined to any one part of Great Britain and Ireland. I have made myself acquainted with the terms of a Bill already drafted by the Sanitary Inspectors' Association. The memorandum, which forms its preface, shows that its scope is intended to be limited to England. This is, I think, its main weakness. Nothing of this character should be fragmentary or sectional in its application. Scotland gives security of tenure to her Inspectors, and our great regret is that English and Irish Inspectors are not yet partakers in this great personal and public benefit. So in the matter of a Government scheme of superannuation for Sanitary Inspectors it would be, I imagine, more speedily obtained by a well-directed and united effort than by one partial and local in its character.

As to the need of a general and systematic course of instruction and a legalised examination for inspectors, there can surely be no diversity of view. As far back as 1894 Sir Walter Forster, then chairman of the Local Government Board under the Liberal Government, convened a meeting in London to consider this question. We were informed at that time that "the feeling of the meeting was unanimously in favour of the proposal that a Central Board should be erected for these purposes, and it was remitted to a committee to draw up a scheme to be submitted to the chairman of the Local Government Board." Has such a scheme been drafted? If so, what is it, and where is it? are questions which we may now reasonably and legitimately ask the Council of the Institute under whose auspices we are met here to-day. We cannot go on much longer with honour to ourselves or with benefit to this important branch of the public service without a special education and without a general legalised standard of proficiency in knowledge and adequacy of training. Gentlemen, none of us can afford to be classed as the "lay quacks" of the public hygienic service. We must know our subjects and our work thoroughly, and once resting in that knowledge, we may step boldly forward and claim protection for our positions alike from the Government and from the Sanitary Local Authorities under whom we serve.

It now only remains to me to say a word on union. I have spoken before in the cause of union. I have listened to its virtues being extolled. I have seen, speaking man to man, the sorrow expressed that yet hundreds of inspectors are un-related to their brothers, but in the will to humbly do their best. I have not conversed with one whose creed is based on a love for individualism. Yet throughout our country there are many inspectors like Coleridge's Ancient Mariner, "Alone on a wide wide sea." Toiling, and moiling, day in and day out, in their ocean of nuisances, recording, warning, prosecuting, they, in this day of unions and trade and professional combinations, think to prosper and "let the world slide." Whence is this seeming contradiction between the almost unanimous recognition of the value of unions and their practice of non-unionism? Is it enough in these times that any inspector should be as a common individual in the State? If so, is there nothing due to brotherhood, nothing to be attempted for the future of the noble vocation he represents? It may be hopeless to appeal to our unattached brother inspectors. Their ears are closed by continued absence from conference. Yet we can appeal to the xisting Associations. What have they done in thi ause of union? What are they doing to foster the gr associated life, not only among the thousands in our pro but also among the societies of inspectors throughout th countries? What barriers exist which divide the Sout North, the East from the West? It is not surely disincl It cannot be any jealous feeling, nor foolish quest precedence or I would not now be in this chair. It assuredly want of necessity, never was necessity great now. Difference of sanitary creed does not stand in o we all believe in one Goddess—Hygeia.

Whence then our separation, why the absence of a yearly pan conference of inspectors? How has the power of organization failed to unite us as a solid a pregnable whole? These are questions to be answered, men, not questions to be shirked. We know that distan effectually separates bodies, but the spirit overcomes 1,00 as easily as one. If the spirit of union once descends u and inspires an insight into the incalculable power of cohesion, we shall not long be working as we are now in s and disjointed detachments. We want a uniform policy nuisances, tenure of office in England and Ireland as it in Scotland, liberal and controlled technical educatio recognised examination, absolute freedom in action f sonal control or from fear of any man in the disc public duty.

Until these things are obtained in the three Kingdon we nor our public work will be right nor satisfact public interest. What can gain us these things? Uni close, brotherly, helpful union is the "open sesame and influence. Without it, disintegration is at hanc and destroy even our existing organizations. It is hope that as the seeds of union were sown, when brothers invaded Scotland in great force four years in a near hour the fruit of that seed will appear a by every Inspector in these Kingdoms who bea badge of a Sanitary Authority.

CONFERENCE OF LADIES ON DOMESTIC HYGIENE.

ABSTRACT OF ADDRESS

BY MRS. FAWKES,

PRESIDENT OF THE CONFERENCE.

BEFORE beginning this conference I should like to say a very few words to define the position of women towards the science of sanitation. There may be some present to-day who are not aware that within the last few years women have had official recognition in this matter. The first local authority to appoint a woman as Sanitary Inspector was the Corporation of Nottingham in the year 1892. This example has been followed by many others, and there are now in all eighteen women at work under various sanitary authorities.

We must all rejoice that there is this new scope for women's work, but at the same time, I feel very strongly that it is not in official work that women can do most for this great cause. We all need to be awakened to the responsibility all (however narrow their sphere may be), have in this matter, and what they can do by example and precept. We have two formidable giants to fight, Ignorance and Prejudice, and in order to teach we must know; therefore, it is well we should meet here to-day to learn all we can about a science on which so much of the health, and consequently of the happiness of the human race depends.

LECTURE TO THE CONGRESS,

y H. PERCY BOULNOIS, M.Inst.C.E., City Engineer, Liverpool.

SOME SANITARY ADVANCES IN MUNICIPAL ENGINEERING.

THE subject that I have chosen to lecture to you upon is "Some Sanitary Advances in Municipal Engineering." You will see hanging from the gallery a diagram, which shows some of the many branches of municipal engineering work;* even the duties which are there enumerated do not include all the subjects concerning which a municipal engineer is expected to know something. To speak to you on all the matters that come within the municipal engineer's province I should have to keep you here for a week, but I have put the diagram there in order to give you some idea of the marvellous progress that has been made in municipal engineering during the reign of Her Most Gracious Majesty Queen Victoria.

The municipal engineer, or the town surveyor as he is commonly called, was practically unknown before the Queen came to the throne; and I hope, before I have finished, to tell you something of the progress that has been made by that officer during this short period of little over sixty years. I take credit for the branch of the profession to which I belong, and my brother officials for the advance which, in spite of the greatest opposition, has been made. Municipal government theoretically is splendid; practically it often fails, and for two or three reasons. It fails principally because that government is ever changing. As each succeeding November comes round, fresh men are elected to representative positions. The consequence is that the municipal engineer has no sooner educated his committee to the proper standard than he has to go through the same process with a new committee: this, naturally, is very much against advancement. Then again, in smaller towns, I am bound to admit, men often get positions upon local governing bodies for purposes purely their own.

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* A similar diagram is given in Vol. XIII., page 320.

Indeed, it is well known that in many districts the ready "spouter" is more likely to be elected than a man not so fluent of tongue who has really the interests of the place at heart.

I will now proceed to tell you something about the various subjects which come under the head of sanitary matters. First as to drainage and sewerage, we must all be agreed that house drainage has made marvellous strides during the past few years. This has been contributed to, to no small extent, by our chairman, Mr. Pridgin Teale, whose largely circulated book drew the attention of the community to existing defects in sanitary matters—the spreading of knowledge which after all is more important than legislation; education undoubtedly comes first, legislation afterwards. With regard to sewerage, we all knew what that used to be. The sewers were exceedingly defective and badly constructed—in fact, mere elongated cesspools, worse than if they had not existed at all. The municipal engineer has changed all that, he has taken up the matter scientifically, he has seen that the drains are properly designed and properly carried out, and consequently large communities are now able to live together with almost perfect immunity from disease, which would have been impossible in the old days. Now with regard to sewers. Careful as we may be in their construction, careful as we may be in the gradients we give to them, we find, in nearly all cases, or rather I would say in many cases, that it is advisable they should be assisted by flushing. The flushing of public sewers is carried out in various ways; either by automatic flushing-tanks placed at the heads of various sewers or by hose-pipes being put into the manhole, or by penning back the sewage by means of a valve, which is afterwards raised and the sewer is thus flushed.

The third plan is by having large tanks or wells put over the manhole, empty; these tanks are filled from the nearest hydrant and let go into the sewers. I will show you how the operation by means of tanks is carried out in Liverpool. The tank shown on the screen holds 2,000 gallons of water and empties in about thirty seconds; we have a telescope arrangement which goes a long way down the manhole so that the stream of water is poured directly into the sewer; a great deal of the good effect being lost when the water fell from a height. In addition to flushing the whole of the sewers of Liverpool four times a year, we also flush the whole of the private drains of every house, large or small, throughout the city, free of cost to the owner or occupier. I do not know what other town or city does that.

The object of this is two-fold. One is that it cleanses the drains out; still more important it acts as a detector. It soon

scovers where anything is wrong and the matter can then
peedily remedied. In this slide is seen a house flusher at wo
n court property. They are worked by gangs of three me
nd wherever there is a trap or an entry of any kind to t
drain there they go. It costs Liverpool £4,500 a year to
this, and it is money well spent.

I will now touch lightly on the subject of sewage d
posal. There are a great many papers on this subject at t
present Congress; without doubt it is a burning question.
cannot be doubted I think that during late years progress h
been made in this direction. Formerly there was no attem
at treating sewage, it was allowed to run on of its own sw
will in any direction it chose. But the engineer and t
chemist have been at work and all manner of devices have bee
put into operation for the purpose of precipitating the sol
matter, and allowing the effluent to flow on more or less pure
be treated chemically or otherwise.

The great difficulty hitherto has been that the chemist h
tried to arrest decomposition. The result has been that in a
effluent, apparently free from anything deleterious, decompos
tion has afterwards set in. Nature will have its pound of fles
Nature has given us decomposition as a great force. I belie
that in this direction of sewage treatment, Mr. Cameron,
Exeter, is on the right lines with his Septic system.

I know many will disagree with me, but I cannot hel
thinking that there will be great strides made in that directio
and that we shall find it advisable instead of opposing natur
in the way we have done, that we ought to assist nature in wh
she ought to do. With regard to irrigation, I believe in
sewage farm properly and carefully laid out by an engineer w
knows his subject, and efficiently managed, which is of ev
greater importance, provided you can get the right sort of la
There is, I think, still a great deal to be done with sewage irri
tion. Colonel Jones would be glad to hear me say that. I h
had handed over to me two sewage farms within a stone's th
from each other. A view of one of them I feel proud to s
you, but the other is a bad farm. Here is a view of the
farm, in which you will notice a big open sewage carri
both sides you see the crops growing. The gradient of a
should be about 1 in 800. In this case the soil of the f
clayey—unsuitable altogether for the purpose it is requir

And now I will pass to another point, that of the
of house refuse, which has always been somewhat of
culty, and I will explain one of those plans which h
adopted at Liverpool for a great many years, and
to take the stuff out to sea. For that purpose tw

the Alpha and Beta, have been built, and perhaps in time they may get through the whole of the Greek alphabet. These barges carry from 300 to 400 tons in hoppers, they go out twenty-six miles to sea; and this has been going on for a great number of years, and is rather a cheap way of getting rid of house refuse. The fishermen, however, are beginning to complain, and there are complaints that on the Welsh Coast there are signs of corks that came from Liverpool. Still, the plan is a very good one, though, of course, there are objections. There is rough weather when you cannot send the barges, there is the breaking down of machinery, so that undoubtedly the best plan, the most modern method of disposing of house refuse, is by what is popularly known as a destructor. Of course, it is not really a destructor, for you cannot destroy anything, it is conversion of refuse into various kinds of gases and "clinker." The form of a destructor is probably familiar to many of my audience. The system is one under which the refuse is burned in a furnace in such a way that the fumes are not allowed to escape. That, of course, is very easy to say but not so easy to do, though great strides have been made in that direction. The points to be aimed at in a refuse destructor are, first of all, complete combustion; secondly, no stewing of the stuff as in many cases where it is allowed to rest on the platform; thirdly, of course, no nuisance from the dust blowing about or from the handling of the stuff; and also the process of burning should be so complete that there should be none of those vapours of distillation passing up the chimney and causing a nuisance and danger to people. Of course the danger is slight with a high chimney, although in that case the vapours are simply carried a little further and they eventually descend. Naturally the further they are carried they become more diluted.

Another object of the destructor is the utilization of heat, and the production of "clinker." In a well-conducted destructor there is no nuisance. With regard to the disposal of the "clinker," in the destructor you get 33 per cent. of clinker left behind. Now, what is to be done with that? You see how we deal with it at Liverpool. We put it into barges—contained in boxes—the barges are taken down to the dock, each of the boxes is then lifted out and emptied into the large hopper-barges which go to sea, and the whole of the barge is emptied in about 3½ minutes. That is one way, a wasteful way, of disposing of the clinker. Another method is a more useful way of disposal, which I will now show you on the screen. Here we make footpaths out of the clinker. It is broken small, mixed with cement, and put into a mould and smoothed over. It is then run through a hydraulic press, the pressure being 2¾lbs. to the square inch. The mould is then reversed, and by means of hydraulic pressure a box is placed under the slab, which is then released, falls into the box and is carried away by hand and stacked. We make these slabs at Liverpool at a cost of 1s. 7d. a yard, and a most excellent pavement it makes, and is ready for laying in three months. It is a useful use of the waste product of a waste product.

Now we come to another department in which some very considerable advances have been made; I refer to that of road making. Of course the name of Macadam is as familiar in your ears as a household word, but macadamised roads are only good things for the country. Macadamised roads are very bad things, sanitarily, where there is much traffic, or where shops or houses are closely adjoining. Porous or absorbent roads are not only expensive to maintain, but on sanitary grounds, which I am talking about to-night, they are exceedingly bad. There are various ways of making sanitary pavement, but the best is to first put in a good sound concrete foundation. Then put on that a skin, or veneer—and it is only that because the concrete foundation is really carrying the traffic—of either asphalte, or wood, or stone setts. Of course in the north of England stone setts are generally used, and when they are put on a concrete foundation and grouted properly with bitumen they make a perfectly impervious pavement, and are a sanitary pavement on that account. But nobody will deny that stone setts are exceedingly noisy.

Then we come to asphalte and that, upon sanitary ground, is a splendid pavement. But asphalte is under certain circumstances objectionable. In this climate we are continually having exceedingly greasy, sticky, wet weather, which is absolutely unsuitable for asphalte as a pavement. Latterly wood pavement has been used, but there is a growing objection to its employment, because the blocks being of a fibrous nature, it is absorbent, and takes in the filth of the roads and the moisture, and so comes to be unwholesome on that account. But more latterly still there has been introduced into this country wood that is inabsorbent, wood that is absolutely hard, and wood that comes from one of the most health-giving trees—the eucalyptus tree; I mean the Karri and Jarrah woods of Australia. In this wood you have, to my mind, the best material for a sanitary pavement that you can have.

In this slide you have them making a macadamised road, a road that is very good in country districts, but which is no good in towns. I am showing you now the making of a proper road, and its formation. This is the concrete, and here are the men paving. This is, as you can see by the picture, a road of stone setts. This shows practically the making of an ordinary paved road, which is absolutely impervious to wet.

Now I have touched upon various engineering sanitary advances, and before concluding my lecture there is one special subject upon which I should like to say a few words to you. It may hardly be a matter, strictly speaking, of engineering, but it falls to the lot of the municipal engineer nevertheless, and that is the subject of the Housing of the Labouring Classes. Now, I say Housing of the Labouring Classes advisedly, because the Acts of Parliament have hitherto been only applied to the Housing of the Artisan Classes. From my large experience of a great number of years as a municipal engineer, I am convinced that the ordinary artisan can be supplied with a house by private enterprise, at such a rent that he can afford to pay. But with regard to the labouring classes, the man whose work is very irregular, who is earning twelve, fifteen, eighteen shillings a week, that is the man who is wanted to be housed; and hitherto the attempts that have been made to house him properly have not been very successful.

The fact is that the houses that have been provided are, to my mind, too good—if I may say so. But let me be distinctly understood; I mean that these houses cannot be too good in all their sanitary requirements, and in all their sanitary arrangements, but they can be too good in many ways; in point of size for instance, in point of ornamentation, in point of various details of construction in staircases and floors. These matters have made the giving of the labouring classes houses at a rent that they can afford to pay, an almost insoluble problem. Well, I have come to the conclusion, and I did some years ago, that you ought to make up your minds that there should be a unit. My unit has been one shilling per room per week, as being the most that these people ought to be asked to pay.

Now in Liverpool we have, I suppose, a class of people who are really exceedingly poor, whether by their own fault or not, I am not prepared to say. These people live in the most wretched courts and hovels. You have upon the screen now an instance of the kind of court I mean. But this is rather a good one, I mean in point of appearance, for I could have found very many worse ones than this one, had I been taking the photograph. But let us take this as a fair sample of the courts we have to deal with in Liverpool. The population of it is really the worst feature. The house consists of a cellar which is never used, and which is always full of filth. Then we come to the living room, and there is a bedroom over that, and yet another bedroom over that. There is a staircase going u inside the rooms to the top. These houses are all built bac to back, and there is absolutely no ventilation. If you go int one of these courts on a summer day, the smell is alway offensive, and I will defy you to stay in any of the rooms fo more than three minutes at a time. The Corporation of Liver pool, under their special Acts of Parliament, have destroye many thousands of these wretched court-yards, and are stil proceeding with the work, but the difficulty has been, hitherto how to provide for the displaced population. These peopl cannot afford to pay more than 2s. 6d. or 3s. a week, which the pay for these very inferior abodes.

This is a great problem. Artisans' dwellings are too ofte palatial residences, erected on a lavish scale, and occupied b people who, I venture to say, are not the ones for which thes dwellings are intended. I took up this problem on my ow account, and tried to give a different class of house altogether I have succeeded in building different types of tenement houses three storeys in height, let off in tenements. The larges tenements have four rooms and the smallest two. The averag rental that we are getting is 1s. 1½d. per room per week, o very near the unit which I have laid myself out to get. The are built upon land valued at 12s. per square yard, and ar bringing in from 4½ to 5 per cent. nett, after allowing fo all such leakages as rates, repairs, people not paying thei rent, and so on. This is the class of house we want. The are built exceedingly cheaply, the floors being made of ol tramway sleepers as joists, filled in between with a concret that will take a nail. There are not many concretes th will do that. With this class of tenement you must be ve careful that each floor is watertight, and these are. F the people are apt to be careless, and when a tenant fin a pail of water streaming through the ceiling, he brings claim for damages to his goods and chattels. The steps a all the other concrete work that may be used, and the st cills and window bends are made from our clinker refuse fr the destructor.

You will notice the windows, they are French ones, eas opened, and the glass with which they are glazed is in sm pieces, and consequently very cheap to repair; in fact eve thing is studied with a view to economy, but everything is in t most perfect sanitary order that we can get. For 4s. 6d. week rent they can get a house with a sitting room, a bedroo and another bedroom behind it, with a large scullery and court-yard ten yards long and wide, and I can only tell yo that they are no sooner built than people are clamouring a tenants for them, and I believe honestly that we have met the demand of this class of tenant for a house of this description. There is one matter in connection with this. All would be absolutely impossible of provision for this class of tenant by private enterprise, but the Corporation can do it for this reason:—They can put a caretaker in one of these houses who is responsible for the collection of the rents and for the behaviour of the tenants, and that is the only way in which you can meet the case.

This slide now before you is my own workshop where we get out some of these schemes which I have talked to you about to-night. It is one of my drawing offices in my own place in the Municipal Buildings at Liverpool. So now you see what the office of a municipal engineer is like, where are devised those schemes which sometimes come to bear fruit and sometimes are laid aside and forgotten. I must apologise for having chosen the subject that I have, but it is one that is very dear to me after twenty-six years of a municipal engineer's life, and I hope you have not been terribly worried by hearing me talk about it.

CONGRESS AND EXHIBITION AT LEEDS.

The Sixteenth Congress and Exhibition of the Institute was held at Leeds from September 14th to 18th by invitation of the Right Honourable the Lord Mayor and Corporation.

Very suitable accommodation was provided for the meetings of the Congress in the Town Hall, Yorkshire College, Municipal Buildings, School Board Offices, and the Methodist New Connexion Hall.

The Congress was received by the Right Honourable the Lord Mayor (Sir James Kitson Bart, M.P.), and his speech of welcome was responded to by Sir Douglas Galton, K.C.B., F.R.S., Vice President and Chairman of Council on behalf of the Institute, and by Dr. Robert Farquharson, M.P. (President of the Congress), on behalf of the Congress.

A Public Luncheon was held in the Yorkshire College at which Councillor Womersley presided, and the following toasts were proposed:—

The Queen, by the Chairman.

The Sanitary Institute and Congress, by the Chairman.
Responded to by Sir Douglas Galton, K.C.B., F.R.S.

The City and Industries of Leeds, by Dr. Robert Farquharson, M.P.
Responded to by Sir John Barron.

The first General Meeting was held on September 14th. Sir Douglas Galton, Chairman of Council, installed Dr. Robert Farquharson, M.P., as President of the Congress, who delivered his Inaugural Address.

The Right Hon. the Lord Mayor formally opened the Exhibition, which was held in extensive temporary buildings, erected on the grounds of the West Riding Royal Engineers in Camp Road.

The Exhibition remained open till October 9th, and was visited by 75,790 people. A list of the Awards made by the Judges is given on page 369.

The business of the Congress was divided into three Sections, and six Special Conferences were held. Particulars of these are given in the programme of the Congress in Part II. of the Journal. The Presidents' Addresses are published in the present number of the Journal. The papers read in the Sectional Meetings with the discussions upon them will be published in Part IV. of the present volume, and an abstract of the proceedings of the Conferences will be given in Part I. of Vol. XIX.

During the meeting an excursion was made to the New Royal Baths at Harrogate, and a Garden Party was given at Manston Hall.

Visits were also arranged to Leeds Fireclay Co.'s Works at Wortley, Burmantoft's Works, Destructor and Sewage Works, Electric Generating Station and Electric Tramway Co.'s Car and Shed, Corporation Baths, General Infirmary, New Medical School, Black Dike Mills, and the Shibden Head Brewery.

The closing meeting of the Congress was held on September 17th, Dr. Robert Farquharson, M.P., in the Chair.

Reports of the work done in the different Sections of the Congress, and the Resolutions passed, were read by the respective Secretaries, and the Resolutions were referred to the Council of the Institute for consideration.

Proposed by Dr. R. Farquharson, M.P., seconded by Mr. W. Spinks:—

RESOLVED—"That the most cordial thanks of The Sanitary Institute and Congress are due to the Rt. Hon. the Lord Mayor, Lady Mayoress, and Corporation of Leeds, for the reception accorded to the Meeting and for the welcome they have given to the Members in the City."

Proposed by Alderman Fraser of Hull, seconded by Dr. Armstrong, of Newcastle-upon-Tyne:—

RESOLVED—"That the most sincere thanks of the Congress be tendered to the Council of the Yorkshire College, to the School Board, and to the Trustees of the Wesleyan New Connexion Hall, for the very suitable and convenient Rooms, and the facilities accorded to the Congress, which have greatly enhanced the success of the Meeting."

Proposed by Major Lamorock Flower, seconded by Mr. H. A. Roechling, of Leicester:—

RESOLVED—"That the hearty thanks of the Members of the Congress be given to those who have so kindly shown hospitality at private receptions by privileges accorded to the Members, and at the various Excursions which have added so greatly to the pleasure and enjoyment of the Meeting."

Proposed by Dr. J. F. J. Sykes, seconded by Mr. W. J. Dibdin, of London:—

RESOLVED—"That the earnest thanks of the Congress are due to the Local General Committee, the various Sub-Committees, and the Local Secretaries, for their arduous labours in their several departments, and for their unremitting exertions in carrying out the many details in the organisation of the Congress, which have culminated in such a successful Meeting."

Proposed by Mr. T. Fairley, seconded by Mr. James Lemon, of Southampton:—

RESOLVED—"That the thanks of the Meeting are due to the Representatives of the Press for the admirable reports which have been published of the proceedings, and which are largely instrumental in the dissemination of the teachings of the Congress."

Proposed by Prof. J. Lane Notter, seconded by Dr. Churton, of Leeds:—

RESOLVED—"That this Meeting desires to express to Dr. R. Farquharson, M.P., President of the Congress, their high appreciation of the great services that he has rendered in presiding over the Meeting, and all the personal interest which he has so kindly displayed in its work and in the interest of the Members attending."

LEEDS EXHIBITION, 1897.—LIST OF AWARDS.

SILVER MEDALS.

Blackman Ventilating Co., Ltd., 63, Fore Street, E.C.

Coke Screen for Ventilating Purposes.

Cadbury Bros., Bournville, Birmingham.

Cocoa.

F. C. Calvert & Co., Bradford, Manchester.

Pure Carbolic Acid.

Davis Gas Stove Co., Ltd., 200, Camberwell Road, S.E.

"Metropolitan" Gas Cooker.

J. Defries & Sons, Ltd., 147, Houndsditch, E.C.

Pasteur Chamberland Domestic Filter.

J. Defries & Sons, Ltd., 147, Houndsditch, E.C.

Portable Hot Spray Disinfector.

Expanded Metal Co., Ltd., 39, Upper Thames Street, E.C.

Expanded Metal.

The Ferrybridge Foundry Co., Ferrybridge, Yorks.

Fryston Duplex Fire Kitchener.

J. S. Fry & Sons, Ltd., Bristol.

Cocoa.

Hughes & Lancaster, 47, Victoria Street, S.W.

Shone's Hydro-pneumatic Ejector.

Jas. Milne & Son, Ltd., 48, Wellington Street, Leeds.

"Instanter" Grip Fire Hose Connection.

Leeds Fireclay Co., Ltd., Leeds.

Wall Decorations in Burmantofts Faience.

Reynolds & Branson, 14, Commercial Street, Leeds.

Apparatus for Analysis of Air, Water, Foods, etc.

Shanks & Co., Barrhead, N.B.

"Fin de Siècle" Bath.

BRONZE MEDALS.

Cannon Hollow Ware Co., Deepfields, near Bilston, Staffordshire.

Enamelled Cast Iron.

Cannon Hollow Ware Co., Deepfields, near Bilston, Staffordshire.

"Hercules" Gas Cooker.

The Cordelova Co., Ltd., 74, Pitt Street, Edinburgh.

Cordelova Wall Coverings.

Claughton Brothers, Bramley, Leeds.

The "Niagara" Water Waste Preventer.

Day's Automatic Waste Water Closet Co., 22, Lichfield Street, Wolverhampton.

Day's Stafford Slop Water Closet.

S. Dixon & Son, 31 to 41, Swinegate, Leeds.

Incandescent Arc Outside Lamp.

Alfred Dougill & Co., Ltd., 36, Gt. George Street, Leeds.
Gas Engine convertible into Oil Engine.

Jas. Duckett & Sons, Ltd., Sanitary Ware Works, Burnley, Lanc
"Clencher" Washdown Closet.

Farnley Iron Co., Farnley Works, Leeds.
White and Coloured Glazed Bricks.

The Farnley Iron Co., Farnley Works, Leeds.
White Enamelled Fireclay Bath without Fittings.

The Farnley Iron Co., Farnley Works, Leeds.
White Enamelled Fireclay Sinks without Fittings.

Ferrybridge Foundry Co., Ferrybridge, Yorks.
Fryston Lifting Fire Kitchener.

William Gooding, North Road Works, Metropolitan Cattle Market
Islington, N.
Combined Safety Valve and Fusible Plug.

William Gooding, North Road Works, Metropolitan Cattle Market
Islington, N.
Interchangeable Rubber Stair Treads.

Henry Jackson, 134, Westfield Road, Leeds.
Self-Feeding Circulating Boiler.

John Jones, 40, Sydney Street, Chelsea, S.W.
Releasable Stopper for Cleaning Arm of Disconnecting Trap.

Leeds Art Pottery & Tile Co., Leathley Road, Hunslet, Leeds.
Faience Tile Dados.

Leeds Fireclay Co., Ltd., Leeds.
Glazed Bricks.

Leeds Fireclay Co., Ltd., Leeds.
Shoppee's Dovetail Bricks.

Leeds Fireclay Co., Ltd., Leeds.
Tiltman's Division Bricks.

Leeds Fireclay Co., Ltd., Leeds.
Vitreous Glazed Terra Cotta.

Leeds Fireclay Co., Ltd., Leeds.
White Enamelled Fireclay Bath, without Fittings.

Leeds Fireclay Co., Ltd., Leeds.
White Enamelled Fireclay Sink, without Fittings.

Richard Mason, Hemsworth, near Wakefield.
Reversible Window and Fanlight.

Mellin's Food, Ltd., Marlborough Works, Stafford Street, Peckham,
London, E.C.
Mellin's Food for Invalids.

Jas. Milne & Son, Ltd., 48, Wellington Street, Leeds.
Sink Waste Fittings.

Jas. Milne & Son, Ltd., 48, Wellington Street, Leeds.
Upright Combination Bath Fittings with large Outlets.

New Patent Broom Co., Paragon Wks., Stoke Newington, London, N
Paragon Bass Brooms.

Noble, Brown & Co., Nobro Works, Firth Street, Leeds.
Nobro Portable Fire Pump.

Patent Gully Co., Ltd., St. Peter's Church Walk, Nottingham.
Crosta's Iron Road Gullies.
Price's Patent Candle Co., Ltd., Belmont Works, Battersea, London, S.W.
Pure Glycerine.
R. H. Quine, 1, Leaf Square, Pendleton, Manchester.
Sanitary Ashbin.
John Russell & Co., Ltd., 15, Wellington Street, Leeds.
Wrought Iron and Steel Tubes.
John Russell & Co., Ltd., 15, Wellington Street, Leeds.
Cup Fittings for Incandescent Gas Lamps.
Teale & Somers, 48, Woodhouse Lane, Leeds.
Raised Hearth and Sunk Fire.
Vimbos, Ltd.. 13c, Queen Victoria Street, London, E.C.
Vimbos Fluid Beef.
E. Walker & Co., Heckmondwike, Yorks.
Walker's Block Tin Lined Iron Pipe.
Whiteley Exerciser, Ltd., 20 and 21, Laurence Pountney Lane, Cannon Street, E.C.
Health Exerciser.
Wilson & Stockall, Bury, Lancashire.
Accident Ambulance Carriage.

DEFERRED FOR PRACTICAL TRIAL.

Cameron, Commin & Martin, 7, Bedford Circus, Exeter.
Septic Tank System of Sewage Treatment.
R. Clarke & Co., Milton Works, Heckmondwike, Yorks.
"Eureka" Lead Incased Block Tin Water Pipe.
Abraham Thomas Cooper, 92, Moray Road, London, N.
Cooper's Suction and Vacuum Pump.
Davis Gas Stove Co., Ltd., 200, Camberwell Road, S.E.
Open Ventilating Gas Fire.
Alfred Dougill & Co., Ltd., 36, Great George Street, Leeds.
Tornado Air Propeller.
Doulton & Co., Lambeth, S.E.
"Ellison's" O.B. Closet.
Formalin Hygienic Co., 9 and 10, St. Mary-at-Hill, London, E.C.
"The Alformant."
Formalin Hygienic Co., 9 and 10, St. Mary-at-Hill, London, E.C.
"Formalin."
Hughes & Lancaster, 47, Victoria Street, S.W.
Fischer Stone Filters.
Irving, Son, & Jones, 23, Blackstock Street, Liverpool.
Manbu Gluten Flour.
Geo. Jennings, Lambeth Palace Road, S.E.
Duplex Supply and Sanitary Waste Valves for Lavatories.
Geo. Jennings, Lambeth Palace Road, S.E.
Duplex Supply and Sanitary Waste Valves for Baths.

Jeyes' Sanitary Compounds Co., Ltd., 64, Cannon Street, E.C.
Formogenic Auto-clave.
John Jones, 40, Sydney Street, Chelsea, London, S.W.
Automatic Flushing Cistern for Urinals.
John Jones, 40, Sydney Street, Chelsea, London, S.W.
Ball Valves.
B. Kühn, 36, St. Mary-at-Hill, London, E.C.
"Chinosol."
Washington Lyon, 85, Asylum Road, Peckham, S.E.
Steam Disinfector.
Manchester Gas Cooker, Ltd., Albert Works, Huddersfield.
Gas Governor.
Richmond & Co., Ltd., Warrington.
Gulf Stream Geyser.
Sissons Bros. & Co., Ltd,, Sculcoats, Hull.
Sanitary Washable Distemper.
J. Stott & Co., Vernon Works, Oldham.
Electric Motor Dynamo.
Torpedo Ventilator Co., 32, Eyre Street, Sheffield.
Torpedo Ventilators.
United Alkali Co., Exchange Buildings, Liverpool.
Hypo-chlorite of Soda Solution.
Valveless Syphon Co., Kirkstall, Leeds.
Waterwitch Ball Valves.
E. Walker & Co., Heckmondwike, Yorks.
Walker's Aluminium Lined Pipes.
E. Walker & Co., Heckmondwike, Yorks.
Frost-Resisting Pipes.

LETTERS OF THANKS OR RECOGNITION.

Adams & Co., Park Lane Works, Leeds.
Gentlemen's Lavatory.
Blind Institution, Leeds.
Baskets and Brushes.
British Institute of Preventive Medicine, 74, Great Russell Street, London, S.W.
Cultivations of Bacteria.
Claughton Bros., Bramley, Leeds.
Ornamental Lead Work.
Doulton & Co., Lambeth, London, S.E.
Ladies' Lavatory.
Reynolds & Branson, 14, Commercial Street, Leeds.
Exhibit of Models, Diagrams, Lantern Slides, and Apparatus in relation to Physiology.
Shanks & Co.. Tubal Works, Barrhead, N.B.
Specimens of Old Defective Work.

HENRY LAW, *Chairman of Judges.*

NOTES ON BOOKS AND PAPERS IN TRANSACTIONS.

"Handbook of Health and Hygiene," by **John E. Dowling**, M.D. *Gill & Son.* Dublin, 1897.

The Author, in this little Handbook, has endeavoured to bring together leading facts of Hygiene for use by visitors to the dwellings of the poor, either during health or in sickness, and for home reading of those unused to scientific subjects.

In eight chapters the author deals with Air and Ventilation, Water, Sewage and Drainage, Infection and Disinfection, Food, Dwelling House, Personal Hygiene, Accidents and Emergencies.

"Hygiene and Public Health, by **Louis C. Parkes**, M.D., D.P.H.,Lond. 551 pp. *H. K. Lewis.* London, 1897. *Price 10/6.*

Intended as a Manual for those preparing for the Diploma in Public Health and the Honours Stages of the Hygiene Examinations of the Science and Art Department, this work has now reached the fifth edition, which is enlarged and revised to keep abreast of advancing knowledge.

"The Sanitary Inspectors' Handbook," by **Albert Taylor**, 332 pp. 8vo. *H. K. Lewis.* London, 1897. *Price 5/-*

This is the second edition of the Handbook, which has been revised and added to where necessary to bring it up to date.

A feature of the book is the arrangement in columns of the provisions of the Public Health (London) Act, 1891, with the corresponding Sections of the Public Health Act, 1875, its Amendments and other Acts incorporated therewith.

The book is freely illustrated, and deals with the various matters which come daily under the notice of a Sanitary Inspector, it being the aim of the author to supply practical information from his own experience, and not to write a scientific book of reference, or complete manual.

"The Institution of Civil Engineers, Minutes of Proceedings," Vol. CXXIX. Part III. 1896-7.

In these minutes there are three papers with discussions upon them which are of interest from a Sanitary standpoint.

Cold Storage at the London and India Docks, by H. F. Donaldson, M.Inst.C.E.

The Main Drainage of London, by J. E. Worth, M.Inst.C.E., and W. Santo Crimp, M.Inst.C.E.

The Purification of the Thames, by W. J. Dibdin, F.C.S., F.I.C.

Among "other selected papers" is

Junee Water-supply Works, N.S.W., by H. A. Blomfield, M.Inst.C.E.

Among "Abstracts of Papers in Scientific Transactions and Periodicals" are—

The Water Supply of Magdeburg, by Peters (Gesundheits-Ingenieur, 30th June, 1897, p. 193).

Water Supplies in Southern California, by J. L. Van Ornum (Journal of the Association of Engineering Societies. February, 1897, p. 128).

The Cleansing of the Hamburg Open Filter-Beds in Times of Frost (Gesundheits-Ingenieur, 31st May, 1897, p. 157).

Lead Poisoning in connection with a Domestic Water Supply, by V. Schneider (Gesundheits-Ingenieur, 31st March, 1897, p. 87.

The Sewerage of Paris, together with the Purification of the Sewage Water (Annalen für Gewerbe und Bauwesen, 15th May, 1897, p. 195).

The Existing Methods of Clarifying Sewage-Water and their respective Values, by Dr. Marx (Deutsche Viertel-jahrsschrift für öffentliche Gesundheitspflege, 1897, p. 260).

The Conversion of Fœcal Matters into Poudrette, by Dr. Vogel (Gesundheits-Ingenieur, 15th March, 1897, p. 74).

The Dissemination of Infectious Diseases by Means of the Atmosphere—1. Typhoid Fever, by Dr. Eduardo Germano (Zeitschrift für Hygiene, 1897, p. 403).

Atmospheric Infection, by C. Flügge (Zeitschrift für Hygiene, 1897, p. 179).

A new method of Disinfection by means of Formalin, by Dr. Hans Aronson. (Zeitschrift für Hygiene, 1897, p. 169).

The use of Formic Aldehyde Gas for Disinfection of large apartments, by Dr. E. Pfuhl. (Zeitschrift für Hygiene, 1897, p. 289).

The action of Formic Aldehyde as contained in Holzin and Steriform, by Dr. Paul Rosenberg. (Zeitschrift für Hygiene, Vol. XXIV., Part III., p. 488).

Alcohol as a Disinfecting Agent, by Dr. Ferdinand Epstein. (Zeitschrift für Hygiene, 1897, p. 1).

The Germicide properties of Ferric Sulphate, by Dr. Erhard Riecke. (Zeitschrift für Hygiene, 1897, p. 303).

MEETINGS HELD.

Examinations.

At an Examination for Inspectors of Nuisances, held at Cardiff on July 23rd and 24th, 9 Candidates presented themselves.

The following 5 Candidates were certified, as regards their Sanitary Knowledge, competent to discharge the duties of Inspectors of Nuisances.

1897, July 24. Davies, Henry, 1, Beech Street, Ferndale, R.S.O.
1897, July 24. Judd, Henry, 53, Robert Street, Ynysybwl.
1897, July 24. Roderick, Moses, 15, Bailey Street, Pentre, Rhondda Valley.
1897, July 24. Sommerfield, Samuel B., 60, Main Street, Barry.
1897, July 24. Thomas, Henry James, 21, Maindee Parade, Newport, Mon.

Examination Questions.

Inspectors of Nuisances.—Cardiff, July 23rd and 24th, 1897.

1. In an existing building having no means of access to the drainage, how would you proceed to find out the course of the drains, and what tests would you adopt to localise the defects supposed to exist therein?

2. Describe in detail, and make a sketch of the best form of closet for a rural district, where there is no system of sewers.

3. Give a rough sketch plan of a country cottage, shewing the larder, and the sanitary conveniences, all being on the ground floor, and also the position of the well.

4. Describe the construction and method of working a steam disinfector.

5. A reservoir holding 40,000 gallons is filled through a pipe 4 inches in diameter, the velocity through which is 2 feet per second. How long will it take in filling?

6. What facts or appearances would lead you to the conclusion that a certain carcase of an ox was unfit for the food of man?

7. What difference is there in the powers of urban and rural sanitary authorities, respectively, with regard to slaughterhouses? Supposing application to be made for a license for a building which has for some years been used as a slaughterhouse, draw up a report upon the matter, enumerating the points (structural and otherwise) which are essential or desirable in premises intended for such a purpose.

8. What power has a private individual to deal with a nuisance arising on or near his premises?

The Candidates were examined vivâ voce *on the 24th.*

At an Examination in Practical Sanitary Science, held at Norwich, on July 30th and 31st, 1 Candidate presented himself, to whom a Certificate in Practical Sanitary Science was granted:—

1897, July 31. Gôut, George, Beilby House, Cleethorpes, Lincolnshire.

At an Examination for Inspectors of Nuisances, held at Norwich on July 30th and 31st, 19 Candidates presented themselves.

The following 9 Candidates were certified, as regards their Sanitary Knowledge, competent to discharge the duties of Inspectors of Nuisances:—

1897, July 31. Baldwin, Wilfred E., 14, Aldred St., Rotherham.
1897, July 31. Dean, James, 14, Limefield Street, Accrington, Lancashire.
1897, July 31. Frazer, John Alfred, 67, Campbell Street, Hull.
1897, July 31. Glassup, Horace Mumphord, Anglesea Road, St. Mary Cray, Kent.
1897, July 31. Middleton, Leonard Wilburn, 11, Valley Terrace, Shadwell Lane, Moortown, Leeds.
1897, July 31. Rider, Thomas Frank, Brettell Lane, Stourbridge.
1897, July 31. Rushmer, Joshua Flowerday, Lichfield Road, Southtown, Great Yarmouth.
1897, July 31. Stokes, Henry, 11, Cranborne Street, Leicester.
1897, July 31. Warwick, Henry James, 9, Granville Road, Walthamstow.

Examination Questions.

Practical Sanitary Science.—Norwich, July 30th and 31st, 1897.

Paper I.

1. How much carbonic acid is given off per head per hour—

(*a*) In repose;
(*b*) In hard work?

What bearing has this on ventilation?

2. Define the following terms: Relative Humidity — Absolute Humidity—Cyclones—Anti-cyclones—V-shaped depressions—Cols.—Wedge-shaped isobars—Straight isobars.

3. What will be the velocity in feet per minute, and rate of discharge in cubic feet per minute, through a sewer 4 ft. in diameter, and having a fall of 1 in 500, the sewer running half-full?

4. Make a sketch showing the position of, and specify the materials for, vertical and horizontal damp-proof courses in a house wall. Sketch also a 9-inch wall, showing English bond and Flemish bond.

Paper II.

5. What influence has geological formation in rendering water supplies wholesome and palatable?

6. What is the composition of coal gas? What are the products of combustion given off, and how would this affect the ventilation of a room?

7. Upon what principle has the "Septic tank" been applied for the purification of sewage? Explain the change which takes place in the sewage under treatment.

8. What are the relative advantages and disadvantages of heating a public building by hot water and by steam, both under the low pressure and under the high pressure systems?

The Candidates were examined vivâ voce *on the* 31*st.*

Inspector of Nuisances.—Norwich, July 30th and 31st, 1897.

1. Make a sketch of a disconnecting trap, and state where it should be used.

2. Enumerate the chief causes of dampness in a house, and specify in each instance what notices can be served under the Public Health Act, 1875.

3. What steps would you take to remedy the condition of a back yard to a private dwelling supposing the pavement thereof to be in an insanitary condition as to levels and maintenance?

4. An isolation hospital is about to be built on a sandy soil where there is no system of sewerage, describe what system of disposal you would think suitable—
   (*a*) For waste water.
   (*b*) For excreta.

5. What points require special attention in the inspection of—
   (*a*) A canal boat.
   (*b*) Underground rooms separately occupied.
   (*c*) A bakehouse.
   (*d*) A dairy.

6. State exactly how you would collect a sample of water for analysis. What precautions would you take to ensure that the water was not contaminated either in collection or in transit?

7. What diseases are known to be caused by contaminated or infected milk? State how in each case the contamination or infection is likely to have arisen.

8. State briefly the provisions of the Local Government Board Cholera Regulations, issued August, 1890, and August, 1892. What regulations may be made by a local authority in connection with an outbreak of Pleura-Pneumonia?

The candidates were examined vivâ voce *on the* 31*st*.

FORTHCOMING MEETINGS.

Calendar, October to December, 1897.

As far as at present arranged.

Council Meetings are held Monthly on the Second Wednesday in each Month at 5 p.m., except August and September.

Special Purposes Committee	Third Monday at 5 p.m.
Finance Committee	Second Wednesday at 4.30 p.m.
Exhibition Committee	First Tuesday at 5 p.m.
Congress and Editing Committee	Second Monday at 5.15 p.m.
Museum and Library Committee	Fourth Monday at 5 p.m.
Parliamentary Committee	As occasion requires.

OCTOBER.

18 M. Lecture to Sanitary Officers at 8 p.m. Factories, Workshops, and Offensive Trades, by Prof. A. Bostock Hill, M.D., D.P.H.

20 W. Demonstration of Book-keeping as carried out in a Sanitary Inspector's Office, in the Parkes Museum at 7 p.m., by Albert Taylor, Chief Sanitary Inspector, St. George's, Hanover Square.

21 Th. Lecture to Sanitary Officers at 8 p.m. Water Supply, Drinking Water, Pollution of Water, by Prof. W. H. Corfield, M.A., M.D. (OXON.), F.R.C.P.

23 S. Inspection and Demonstration at the Southwark and Vauxhall Waterworks, Hampton, at 3 p.m.

25 M. Lecture to Sanitary Officers at 8 p.m. Infectious Diseases and Methods of Disinfection, by H. R. Kenwood, M.B., D.P.H., F.C.S.

27 W. Inspection and Demonstration at Disinfecting Station, Chelsea, at 3 p.m., conducted by Dr. Louis Parkes.

28 Th. Lecture to Sanitary Officers at 8 p.m. Diseases of Animals in relation to Meat Supply; characteristics of Vegetables, Fish, &c., unfit for food, by Alfred Hill, M.D., F.R.S.E.

30 S. Inspection and Demonstration at Harrison & Barber's Knacker Yard, Winthrop Street, Whitechapel, at 3 p.m.

NOVEMBER.

1 M. Lecture to Sanitary Officers at 8 p.m. Principles of Calculating Areas, Cubic Spaces, &c.; Interpretations of Plans and Sections to Scale, by J. Osborne Smith, F.R.I.B A.

3 W. Inspection and Demonstration of Disinfecting and Filtering Appliances at J. Defries & Sons, Ltd., 147, Houndsditch. E.C., at 3 p.m.

4 Th. Lecture to Sanitary Officers at 8 p.m. Ventilation, Warming, and Lighting, by Joseph Priestley, B.A., M.D., D.P.H.

6 S. Inspection and Demonstration at Richmond Main Sewerage Works, Mortlake, at 3 p.m., conducted by Wm. Fairley, ASSOC.M.INST.C.E.

8 M. Inspection and Demonstration at the Metropolitan Cattle Market, York Road, N., at 3 p.m.

8 M. Lecture to Sanitary Officers at 8 p.m. Sanitary Building Construction, by Prof. T. Roger Smith, F.R.I.B.A.

10 W. Demonstration of Diseased Meat, at the Parkes Museum, at 8 p.m., by W. A. Bond, M.A., M.D., D.P.H.

11 Th. Lecture to Sanitary Officers at 8 p.m. Details of Plumbers' Work, by J. Wright Clarke.

12 F. 13 S. Examinations in Practical Sanitary Science and for Inspectors of Nuisances, Newcastle-on-Tyne.

13 S. Inspection and Demonstration at the Sewage and Destructor Works, Ealing, at 2.15 p.m., conducted by Charles Jones, M.INST.C.E., Engineer and Surveyor, Ealing Urban District Council.

15 M. Lecture to Sanitary Officers at 8 p.m. Sanitary Appliances, by George Reid, M.D., D.P.H.

17 W. Inspection and Demonstration in the Parish of St. George's, Hanover Square, at 2 p.m. (number limited), conducted by Albert Taylor, Chief Sanitary Inspector.

17 W. Sessional Meeting at 8 p.m. Discussion on The Pollution of Water Supplies by Encampments of Hop Pickers, Casual Workers, Tramps, &c.

18 Th. Lecture to Sanitary Officers at 8 p.m. House Drainage, by W. C. Tyndale, M.INST.C.E.

22 M. Lecture to Sanitary Officers at 8 p.m. Scavenging: Disposal of House Refuse, by Charles Mason, ASSOC.M INST.C.E., A.R.I.B.A.

24 W. Inspection and Demonstration of Disinfecting Apparatus and Model Steam Laundry at St. John's Wharf, Fulham, at 3.30 p.m., conducted by W. G. Lacy.

25 Th. Lecture to Sanitary Officers at 8 p.m. Sewerage and Sewage Disposal, by Prof. Henry Robinson, M.INST.C.E.

27 S. Inspection and Demonstration at the Refuse Destructor and Electric Light Works, Shoreditch, conducted by E. Newton Russell, A.M.I.C.E., Chief Electrical Engineer.

DECEMBER.

3 F. 4 S. Examinations in Practical Sanitary Science and for Inspectors of Nuisances, London.

17 F. 18 S. Examinations in Practical Sanitary Science and for Inspectors of Nuisances, Manchester.

DATES AND PLACES PROPOSED FOR EXAMINATIONS DURING 1898:—

GLASGOW ...	Friday &	Saturday,	Feb. 4th and 5th.
EXETER	„	„	March 4th and 5th.
BIRMINGHAM ...	„	„	April 1st and 2nd.
LONDON ...	„	„	May 6th and 7th.
LEEDS	„	„	June 10th and 11th.
BELFAST ...	„	„	June 24th and 25th.
CARDIFF ...	„	„	July 8th and 9th.
LIVERPOOL ...	„	„	July 29th and 30th.
NEWCASTLE-UPON-TYNE	„	„	Nov. 11th and 12th.
LONDON	„	„	Dec. 2nd and 3rd.
MANCHESTER ...	„	„	Dec. 16th and 17th.

HON. FELLOW, MEMBERS, AND ASSOCIATES ELECTED.

From July to September, 1897, inclusive.

HONORARY FELLOW.

Reg. No.	Date of Election.	
	1897. July.	Kuborn, Dr. Hyacinthe, *Rue du Colard 33, Searning, Liège, Belgium.*

MEMBERS (Mem. San. Inst.)

* Passed Examination in Practical Sanitary Science

1082	1897. July.	Alford, Henry James, M.D. LOND., M.O.H., *Elm Grove, Taunton.*
1061	1897. July.	*Bradley, Francis William, *Cockfosters, Enfield, Middlesex.*
1097	1897. July.	Bruce, William, CERT.ASSOC.M.&C.ENG., *Borough Engineers' Department, Edinburgh.*
1107	1897. July.	Bryning, William George, CERT.M.&C.ENG., *County District Surveyor,* 17, *Higher Bank Road, Fulwood, Preston.*
1080	1897. July.	Buckley, Michael James, ASSOC.R.C.SC.I., ASSOC.M.INST.C.E., M.INST.C.E.I., 41, *Rathdown Road, N.C.R., Dublin.*
1079	1897. July.	Carter, George Fearnley, ASSOC.M.INST.C.E., CERT. ASSOC.M.&C.ENG., *City Engineer's Office. Leeds.*
1094	1897. July.	Catchpole, James Henry, CERT.ASSOC.M.&C.E., 27, *Avenue Road, North Finchley, N.*
1088	1897. July.	Cold, Arthur F. G., M.B., F.R.C.S., D.P.H., M.O.H., *Holwood Lodge, Bromley, Kent.*
1078	1897. July.	*Coller, Edward H., *Cromwell House, Berners Street, Ipswich.*
1074	1897. July.	Cook, Frederick Charles, CERT.ASSOC.M.&C.ENG., *Town Surveyor's Office, Hove.*
1096	1897. July.	*Costain, William Percy, *Blundellsands, Liverpool.*
1102	1897. July.	Crowther, James Alfred, ASSOC.M.INST.C.E., *Borough Surveyor, Town Hall. Bootle.*
1085	1897. July.	Fenton, William Carter, CERT.ASSOC.M.&C.ENG., 10, *Paradise Square, Sheffield.*
1092	1897. July.	Franck-Clarke, Alfred Henry, CERT.ASSOC.M.&C.E., *Hanover House, West End, Morecambe.*
1091	1897. July.	Frobisher, Edward, ASSOC.M.INST.C.E., *Assistant Borough Surveyor, Town Hall, Leicester.*
1105	1897. July.	Gray, George David, B.A., ASSOC.M.INST.C.E., M.INST. C.E.I., *Assistant Engineer, City Hall, Dublin.*
1077	1897. July.	Greenwood, Joseph Parker, CERT.ASSOC.M.&C.ENG., *Deputy Surveyor, U. D. Council, Barry, near Cardiff.*

Reg. No.	Date of Election.	
1083	1897. July.	**Greenwood**, MAJOR, M.D., LL.B., D.P.H., 243, *Hackney Road, N.E.*
1104	1897. July.	**Holden**, James, ASSOC.M.INST.C.E., *Surveyor, Ash Cottage, Ely, Cardiff.*
1085	1897. July.	***Jarman**, Frank W., 4, *High Street, Croydon.*
1103	1897. July.	**Julian**, Julian, CERT.ASSOC.M.&C.ENG., *Borough Engineer's Office, Cambridge.*
1101	1897. July.	**Laurens**, Frank, ASSOC.M.INST.C.E., *District Surveyor, Norfolk Park, Maidenhead.*
1097	1897. July.	**Leete**, William Henry, ASSOC.M.INST.C.E., *County Surveyor*, 12, *The Crescent, Bedford.*
1099	1897. July.	**Lobley**, Frank Joseph, CERT.ASSOC.M.&C.ENG., *City Engineer's Office, Norwich.*
1084	1897. July.	**Lowe**, Charles H., M.INST.C.E., F.S.I., *Vestry Hall, Hampstead, N.W.*
1073	1897. July.	**Manley**, John, CERT. ASSOC. M. & C. ENG., *Borough Surveyor, Wokingham.*
1100	1897. July.	**Marston**, Charles Frederick, ASSOC.M.INST.C.E., F.R.MET.SOC., *Borough Engineer, Sutton Coldfield.*
1090	1897. July.	**McDermott**, Nehemiah Bernard, F.S.I., *Chief Surveyor, War Office, Turrett Lodge, Cavendish Road, Clapham Park, S.W.*
1098	1897. July.	***Morrison**, Alexander, 11, *Osborne Terrace, Edinburgh.*
1089	1897. July.	**Nunn**, Philip W. G., L.R.C.P., M.R.C.S., M.O.H., *Gestingthorpe, Christchurch Road, Bournemouth.*
1078	1897. July.	**Percy**, Rt. Hon. Earl, P.C., D.L., J.P., 28, *Grosvenor Square, W.*; *(Alnwick Castle, Northumberland.)*
1096	1897. July.	**Savage**, Edward Ballard Maxwell, CERT.ASSOC.M. & C.ENG., *City Engineer's Office, Norwich.*
1106	1897. July.	**Smith**, James Gould, ASSOC.M. INST. C.E., *Assistant Surveyor, Vestry Hall, Upper Street, Islington.*
1093	1897. July.	***Styles**, Arthur, 19, *Monson Road, New Cross Road, S.E.*
1110	1897. July.	**Tucker**, Benjamin Roper, *Surveyor, War Office*, 41, *Sisters Avenue, Clapham Common, S.W.*
1076	1897. July.	***Turriff**, Acton Alexander, 3, *Belmont Street, Aberdeen.*
1108	1897. July.	***Walkden**, Samuel Downside, *Whitchurch, Tavistock.*
1109	1897. July.	**Young**, William, CERT. M. & C. ENG., *Town Hall, Salford.*

ASSOCIATES.

‡ Passed Examination as Inspector of Nuisances.

1608	1897. July.	‡**Abbott**, Alfred Ernest, *The Square, Wolverton, Bucks.*
1603	1897. July.	‡**Anning**, John Taylor, *Wadham House, Wentworth Street, E.*

Reg. No. Date of Election.

1607 1897. July. ‡Baxter, John T., 101, *Gower Avenue, Fulham, S.W.*
1613 1897. July. ‡Bemister, Francis, *Guards Depôt, Caterham.*
1629 1897. July. ‡Bonus, Henry Pem, 44, *Hopton Road, Streatham.*
1628 1897. July. ‡Brown, Gilbert George, *Estate Office, Abberley, Stourport.*
1632 1897. July. ‡Browne, Alfred Willis, 15, *Crescent Road, Plumstead, S.E.*
1637 1897. July. ‡Bull, Bernard, 144, *Handcroft Road, Croydon.*
1609 1897. July. ‡Butler, Harold F., 12, *Newby Place, Poplar, E.*
1639 1897. July. ‡Clegg, Warren Leach, *Harefield Cottage, Heywood, Lancashire.*
1620 1897. July. ‡Clifton, Charles Henry, *Sanitary Inspector, Tipton, Staffordshire.*
1616 1897. July. ‡Dodd, Frederick Joseph, 37, *Chrisp Street, Poplar, E.*
1604 1897. July. ‡Elgar, Frederick Samuel, *Nyewood, Bognor.*
1638 1897. July. ‡Farran, Arthur, 88, *Winchester Road, Colchester.*
1640 1897. July. ‡Fawcett, Thomas Henry, 26, *Paragon Road, Blackheath.*
1623 1897. July. ‡Freeman, Albert, *Rickmansworth, Herts.*
1641 1897. July. ‡Green, Walter Herbert, "*Montana,*" *St. Mary's Grove, Chiswick.*
1636 1897. July. ‡Isbell, Archie, *North Street, Fowey, Cornwall.*
1621 1897. July. ‡Jones, Walter William, 49, *King's Road, St. Leonards-on-Sea.*
1631 1897. July. ‡Manley, Miss Gulielma, 52, *Park Lane, Croydon.*
1601 1897. July. ‡Mansfield, Edwin Albert, 1, *Aldermanbury Buildings, E.C.*
1625 1897. July. ‡Martin, Ebenezer, 2, *Lausanne Road, Peckham.*
1633 1897. July. ‡Mettam, Harry, 1, *Stanway Terrace, Parkeston.*
1608 1897. July. ‡Mossop, Thomas, 31, *Bruce Grove, Nottingham.*
1627 1897. July. ‡Newland, Henry, 11, *Artillery Road, Guildford.*
1622 1897. July. ‡Nicholls, Ernest M., 2, *Elm Villas, Albacore Crescent, Lewisham.*
1618 1897. July. ‡Norton, John Barker, 1, *Spencer Place, Leeds, and Calcutta.*
1617 1897. July. ‡Oldfield, Frank Stanley, 25, *Coborn Road, Bow, E.*
1635 1897. July. ‡Pearson, John James, 4, *Brunton Place, Warwick Road, Carlisle.*
1615 1897. July. ‡Powell, George Richard, 56, *Maison Dieu Road, Dover,*
1624 1897. July. ‡Prosser, Ernest Charles Camp, 2a, *Dudley Street, Luton.*
1611 1897. July. ‡Punch, John, *New Street, Sedburgh.*
1605 1897. July. ‡Punnett, Alexander William, *St. Margaret's, Tonbridge, Kent.*
1642 1897. July. ‡Richards, Daniel Elwyn, *Municipal Buildings, Lavender Hill, S.W.*
1602 1897. July. ‡Richings, Miss Ethel Maud, *St. Clement's Rectory, Worcester.*

Reg. No. Date of Election.

1610 1897. July. ‡Robinson, George, *Tatenhill, Burton-on-Trent.*
1628 1897. July. ‡Rye Fred-rick George, 63, *Paradise Street, Rotherhithe, S.E.*
1613 1897. July. ‡Smith, Herbert Sidney, *Rayleigh, Essex.*
1619 1897. July. ‡Stoakes, Harry Adrian Taylor, *W. L. D. Schools, Ashford, Middlesex.*
1614 1897. July. ‡Sturgess, Miss Emma Elizabeth, 72, *Canfield Gardens, N.W.*
1612 1897. July. ‡Vigar, Frank Henry, 12, *Ranelagh Road, Redhill.*
1630 1897. July. ‡Wetjen, William George, 55, *Park Road, West Ham.*
1631 1897. July. ‡Wood, Alexander, 18, *Lambert Road, Custom House, E.*

CONTRIBUTIONS AND ADDITIONS TO LIBRARY

FROM JULY TO OCTOBER, 1897.

⁂ *For publication of Societies and Institutions, &c., see under "Academies."*

ACADEMIES (AUSTRALIAN).

New South Wales. *Royal Society of.* Journal and Proceedings. 558 pp., 8vo. Sydney, 1897. *The Society.*

ACADEMIES (BRITISH).

London. *The Institution of Civil Engineers.* Minutes of Proceedings of. Vol. CXXIX., 1896—1897, Part III. 500 pp., 8vo. London, 1897. *The Institution.*

Cohen, *J. B., Ph.D.* Character and Extent of Air Pollution in Leeds. *The Author.*

Coleman, *T. E., F.S.I.* A Price Book for Approximate Estimates, compiled for the use of Architects, Engineers, and Builders (for pocket). 75 pp. London, 1897. *The Author.*

Dowling, *J. E., M.D.* Handbook of Health and Hygiene. 116 pp., 8vo. Dublin, 1897. *The Author.*

Haden, *Sir F. Seymour, F.R.C.S.* The Disposal of the Dead; a plea for Legislation and a protest against Cremation. (Paper read before Church Congress, Manchester, Oct. 3rd, 1888.) 12 pp., 8vo. London.

——— The Rational and Sanitary Disposal of the Dead. 22 pp., 8vo. (Excerpt from "Liverpool Medical and Chirurgical Journal," July, 1893). *The Author.*

Japan. The Annual Report of the Central Sanitary Bureau attached to the Home Department of the Imperial Japanese Government for the Twenty-seventh year of Meiji (1894). 67 pp., 8vo. Tōkyō, 1895. *Director of Sanitary Bureau.*

Local Government Board. Report on the Preparation and Storage of Glycerinated Calf Vaccine Lymph. 14 pp., fcp. London, 1897.

——— Dr. R. Bruce Low's Report on the Sanitary circumstances of the Horsforth Urban District, with special reference to the public Water Supply there, and its connection with a recent outbreak of Enteric Fever. 16 pp., fcp. London, 1897.

——— Dr. Theodore Thomson's Report on the general Sanitary circumstances of the Borough of Bewdley. 8 pp., fcp. London, 1897.

——— Dr. Theodore Thomson's Report on the Sanitary circumstances of the village of Ribbenhall, in the Kidderminster Rural District. 5 pp., fcp. London, 1897.

——— Dr. F. St. George Mivart's Report on the Prevalence of Diphtheria in Holywell Parishes, and on the Sanitary state of those localities. 14 pp., fcp. London, 1897.

——— Dr. S. W. Wheaton's Report on the Sanitary circumstances of Eaton Bray, in the Eaton Bray Rural District, and upon Administration by the Rural District Council. 5 pp. fcp. London, 1897.

——— Dr. S. W. Wheaton's Report on the Sanitary condition of Swanage, and on Administration by the Swanage Urban District Council. 5 pp. fcp. London, 1897.
Sir R. Thorne Thorne, K.C.B., F.R.S.

London Chamber of Commerce. Report *re* Cement Admixtures, with Evidence of Experts. 197 pp., fcp. London, 1897.

Maxwell, *W. H.* Calculation of Areas, Cubic Space, &c., being Part II. of "Notes on Practical Sanitary Science." 50 pp., 8vo. London, 1897. Sanitary Publishing Co. Price 2/-. *The Author.*

MEDICAL OFFICERS OF HEALTH AND OTHER SANITARY REPORTS.

Blackpool, 1896	*A. Jasper Anderson, M.A., M.B., D.P.H.*
Cheshire C.C., 1896	*Francis Vacher, F.R.C.S.*
Dumbarton C.C., Sanitary Inspector, 1896	*David Dunbar.*
Durham C.C., 1896	*T. Eustace Hill, M.B., B.Sc., F.I.C.*
Eccleshill, 1896	*Pitney Aston, M.O.H.*
Glamorgan C.C., 1896 ..	*W. Williams, M.A., M.D., D.P.H.*
Holborn Board of Works, 1896	*W. A. Bond, M.A., M.D., D.P.H.*
Huddersfield, 2nd qrtr., 1897.	*E. G. Annis, M.R.C.S., L.R.C.P., D.P.H.*
Liverpool, 1896	*E. W. Hope, M.D., D.Sc.*
Nottingham, 1896	*Philip Boobbyer, M.B.*
Paignton, 1896	*C. W. Vickers, D.P.H.Lond.*
St. Giles Board of Works, 1896	*The Clerk to the Board.*
St. Helens, 1896	*John Robertson, M.D., B.Sc.*
St. Olave District, Southwark, 1896	*W. A. Bond, M.A., M.D., D.P.H.*
Salford, 1896..	*C. E. Paget, M.R.C.S., D.P.H.*

Scarborough, 1896 ..	.. *Herbert Littlejohn, M.B., D.P.H.*
Southampton, 1896 ..	.. *A. Wellesley Harris, M.R.C.S., D.P.H.*
Wandsworth, 1896 ..	.. *H. G. Hills, Clerk to the Board.*
Warwickshire C.C., 1897	.. *Prof. A. Bostock Hill, M.D., D.P.H.*
West Sussex, 1896 ..	.. *Charles Kelly, M.D., F.R.C.P.*
Wolverhampton, 1896	.. *H. Malet, B.A., M.D.*

Metropolitan Asylums Board. Report for the Year 1896 of the Statistical Committee, with Appendices. 218 pp., 8vo. London, 1897. *The Board.*

—— The Park Hospital, S.E. 19 pp. London, 1897. *E. T. Hall, F.R.I.B.A.*

Paget, *Charles E., M.O.H.* Wasted Records of Disease. 92 pp., 8vo. London, 1897. *The Publisher.*

Parkes, *Louis C., M.D., D.P.H.* Hygiene and Public Health. 5th edit. 551 pp., 8vo. London, 1897. H. K. Lewis. Price 10/6. *The Publishers.*

Registrar-General, Ireland. Thirty-third detailed Annual Report, containing a general abstract of the numbers of Marriages, Births, and Deaths registered in Ireland during the year 1896. 195 pp., fcp. Dublin, 1897. *The Registrar-General.*

Registrar-General, Scotland. Forty-first Annual Report of Births, Deaths, and Marriages in. 481 pp., 8vo. London, 1897. *The Registrar-General.*

Select Committee on Death Certification. First and Second Reports from, together with the Proceedings of the Committee, Minutes of Evidence, Appendix, and Index. 357 pp., fcp. London, 1893. *Purchased.*

Simla Municipality. Annual Report for the Year 1896—97. 8vo. Simla, 1897. *A. Hale.*

Snell, *E. H., M.D., B.Sc.Lond.* Compressed Air illness, or so-called Caisson disease. 251 pp., 8vo. London, 1896. *The Author.*

Tallack, *William.* Penological and Preventive Principles, with special reference to Europe and America. 2nd Edition. 480 pp., 8vo. London, 1896. *The Howard Association.*

Taylor, *Albert.* The Sanitary Inspectors' Handbook. 2nd edit. 322 pp., 8vo. London, 1897. H. K. Lewis. Price 5/-. *The Publishers.*

Vacher, *Francis, F.R.C.S.* Dangerous Infectious Diseases. 57 pp., 8vo. London, 1897. *The Author.*

War Office. Drainage Manual, 1897. Compiled for the use of Royal Engineer Officers and other persons employed on the construction and maintenance of drainage works in connection with War Department Buildings in the United Kingdom or in similar climates. 108 pp., fcap. London, 1897. *The Secretary of State for War.*

Whitaker, *Wm., B.A., F.R.S.* Some Yorkshire Well Sections. 7 pp. Part II., Vol. XIII., Proceedings, Yorkshire Geological and Polytechnic Society, 1896. *The Author.*

NOTES ON LEGISLATION AND LAW CASES.

Prepared by Dr. H. Manley, M.O.H., West Bromwich.

QUEEN'S BENCH DIVISION.

(*July* 10*th.*, 1897.)

Before MR. JUSTICE CAVE and MR. JUSTICE RIDLEY.

SEAL *v.* MERTHYR TYDVIL, ETC., DISTRICT COUNCIL.

This was a case stated by magistrates raising a question as to the meaning of a "private drain" in Section 19 of the Public Health Act, 1890 (53 and 54 Vic., c. 59).

Mr. MACMORRAN, Q.C., with Mr. PLEWS, appeared for the Appellant; Mr. BRYNMOR JONES, Q.C., and Mr. EVANS for the District Council.

The Section in question is as follows: "19 (1) Where two or more houses belonging to different owners are connected with a public sewer by a single private drain, an application may be made under Section 41 of the Public Health Act, 1875." (3) For the purpose of this Section the expression 'drain' includes a drain used for the drainage of more than one building." The 41st Section referred to, authorises the local authority to charge the expenses of abating a nuisance on the owner of the premises. The case was stated by two Justices for Glamorgan upon the complaint against Mr. T. F. Seal, that he, at the Parish of Merthyr Tydvil, being the owner of certain premises, Nos. 23, 30 to 36, and 38, Cromwell Street, upon which a nuisance existed, had not abated the nuisance. The nuisance alleged was that a certain drain was in a defective condition. The proceedings were taken under Section 41 of the Public Health Act, 1875, as extended by Section 19 of the Public Health Act, 1890. The facts are these: Within the Merthyr Tydvil urban district a number of houses have been erected by the Tydvil's Well Building Club, of which the Appellant is the Secretary and the receiver of the rents, upon both sides of a new street, called Cromwell Street. The houses on the south side are numbered 21 to 40. A drain was made running at the back of the houses through the gardens. This drain joined the sewer of the District Council. A connection from each house with the drain at the back was made by a branch drain. The drain commenced at the back of No. 40, and extended at the back of the houses to the sewer, and it could not be used by other houses. The District Council have adopted the Act of 1890. The Respondents contended that the drain running at the back of the houses 21 to 40 was a private drain under the definition in Section 19 (3) of the Public Health Act, 1890, and that it being out of order the Appellant must abate the nuisance. The Appellant contended that the drain was a drain into which two or more houses belonging to different owners were drained, and that therefore it came within the definition of a sewer contained in Section 4 of the Public Health Act, 1875. The magistrates found that the drain was a drain used by two or more houses belonging to different owners, and that it was a drain for the particular houses Nos. 21 to 40, and for no other premises. They decided that the Respondents had a right to proceed under Section 41 of the Act of 1875. They therefore made an order on the Appellant to abate the nuisance.

Mr. **Macmorran** said the question was, What was the meaning of private drain in the Public Health Act, 1890, Section 19? By Section 2 of that Act the other Public Health Acts were incorporated. By Section 11 (3) the meanings of "drain and sewer" given in the Public Health Act of 1875 were made applicable. He cited the following cases, and pointed out that the decisions had not been uniform: "Travis *v.* Uttley" (1894, 1 Q.B., 233); "Self *v.* Hove Commissioners" (1895, 1 Q.B., 685); "Hill *v.* Hare" (1895, 1 Q.B., 906); "Bradford *v.* Mayor of Eastbourne" (1896, 2 Q.B., 205). This was a case which told against him, but he contended that it was inconsistent with "Hill *v.* Hare," and not, therefore, binding on the Court. He also cited "R. *v.* Mayor of Hastings" (1897, 1 Q.B., 46).

The Court upheld the decision of the Magistrates, without calling on the counsel for the other side.

Mr. **Justice Cave** said that the case was perfectly clear on the decisions brought to their notice. By the Public Health Acts, 1848 and 1875, all sewers were vested in the local authority, and sewers were defined as drains draining more than one house. This was found to create some difficulty, for when one man built two houses on his own land and drained them the drain became vested in the local authority and had to be paid for by them. That was one difficulty, but it was got over by holding that the Act did not apply to houses in the same curtilage, and that the drain, until it came out of the private property into public property, could not be said to be a sewer. Then there came another difficulty. When houses belonging to different owners drained into a sewer, whereby they connected with the public sewers, in that case it was hard that the public should have to pay for what was, in fact, a private drain. The 19th Section of the Act of 1890 was therefore passed. By that Section, when two or more houses belonging to different owners are connected with a public sewer by a single private drain, certain consequences followed. The definition of "private drain" included a drain used for the drainage of more than one building. What, then, was a "private drain"? In the opinion of the learned Judge the term applied to a drain constructed in private grounds to which the public had no access. The intention was that the public were to be relieved from paying for that which they were not allowed to use. In this case it was found that there was no power to drain other houses into this drain. The rational view of a private drain was that this was one. It was said that this view was not in accordance with "Hill *v.* Hare." If, however, in that case the drain was, properly speaking, a private drain, that case was wrongly decided, and, at any rate, it only determined the *status* of the particular drain in question. The magistrates were quite right in their decision, as they found, in fact, that the drain was only for certain houses, and not one into which any other could drain.

Mr. **Justice Ridley** concurred.

GENERAL NOTES.

The Typhoid Epidemic at Maidstone.—Under the personal supervision of Dr. Sims Woodhead, acting on behalf of the water company, the reservoir and mains of the Farleigh area of water supply at Maidstone were on Saturday night disinfected with a solution of chloride of lime. About ten tons of the lime were mixed in the reservoir with 200,000 gallons of water, and afterwards the mains throughout the town were charged at full pressure with the solution. At a certain hour the liquid was allowed to flow through the whole of the house connexions in the districts concerned, and eventually the solution left in the mains was got rid of through the various fire hydrants in the streets.

Veterinary Sugeons and the Public Health (Scotland) Act, 1897.—In discussing the duties of veterinary surgeons under the new Public Health (Scotland) Act, passed this year, the *Journal of Comparative Pathology and Therapeutics* points out that the enactment goes further than any previous measure in recognising the necessity of consulting members of the veterinary profession in the matter of dairy and meat inspection. Section 34 empowers the local authority of any district, other than a burgh, to erect slaughter-houses, or to combine for that purpose with neighbouring local authorities. The section is, it is true, only permissive, but it may have the effect of gradually suppressing the dirty, practically uncontrolled, private slaughter-houses that are still the rule in most parts of Scotland. When these are eventually displaced by public abattoirs it is regarded as certain that the latter will be supervised by veterinary as distinct from medical inspectors. Section 43, dealing with unsound food, empowers any medical officer, sanitary inspector, or veterinary surgeon approved for the purpose by the local authority, to inspect any article of food or any animal intended for food which is exposed for sale, but it stipulates that, in the case of any proceeding under the section with regard to a living animal the medical officer or sanitary inspector, unless he be a qualified veterinary surgeon, shall be accompanied by such a practitioner. A clause in this section empowers each local authority to appoint a place within its district for the examination of any animal alive or dead, and to appoint a veterinary surgeon whose duty it shall be for a fixed fee to examine such animals, and to pass or condemn the same as regards their fitness for human food. It thus appears that the veterinary surgeon is exclusively recognised as the meat inspector; moreover, an earlier part of the section exempts from penalty or imprisonment any person accused of offering for sale unsound meat, provided he can prove that the meat in question had, within a reasonable time prior to the seizure thereof, been examined and passed by a veterinary surgeon approved for the purpose. The inspection of dairies forms the subject of Section 60, which stipulates that the medical officer of health must be accompanied by a veterinary surgeon, approved for the purpose, when he examines animals whose milk is supposed to be causing disease among human beings, and any report by the medical officer of health regarding such an inspection must be accompanied by the report of the veterinary surgeon. The powers intrusted under the Act to members of the veterinary profession are obviously of a very responsible character.—*Times*, Oct. 13th, 1897.

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CONGRESS AT LEEDS.

POPULAR LECTURE,

By PHILIP BOOBBYER, M.B., Medical Officer of Health
for Nottingham.

(FELLOW.)

SOME ESSENTIALS OF POPULAR HYGIENE.

ABSTRACT.

The lecturer began by stating that education must come before legislation, especially in democratic communities, if full benefit were to be derived from legislation. He gave several illustrations of the truth of this statement in matters affecting the public health. Summer diarrhœa, he said, was a soil disease, and one elementary precaution suggested by such a fact was the provision of a layer of concrete under house basements. The Model Bye-laws of the Local Government Board had long ago set the example of approving the adoption of such a precaution; but, because the public—and many members and officials of local authorities—were ignorant of certain elemental facts connected with the causation of diarrhœa, the necessity for it was not appreciated, and it was seldom enforced.

Dr. Boobbyer next gave the headings of his lecture proper. These were as follows:—

1. Food and food stuffs, fresh and preserved.
2. Methods of cooking.
3. Beverages and stimulants.
4. Air and ventilation.
5. Drainage and the disposal of refuse.

Infants, until at least seven months old, he said, should receive the food which nature has provided for them—*i.e.*, their mother's milk— but when, as is now unfortunately too often the case, such food is not available, they should be fed upon other milk artifically sweetened and mixed with varying proportions of water, and this mixture should be well boiled before use. The bottles, too, in which it is given to the infant should also be scrupulously cleaned in warm water, which has been previously boiled, before each time of using. He advocated, moreover, the same precautions, with regard to the sterilizing of food by boiling and the cleansing of food vessels, for older children, especially during summer and autumn. Most of our neighbours on the Continent, he said, are very far ahead of us in their methods of dealing with milk and other animal foods. He gave examples of their superior practice, and described the methods of sterilizing milk before sale in Paris, Berlin, and other foreign cities. He contrasted the mortality of breast fed and hand fed children, and showed how the diarrhœa and other infective poisons found their way into the human body through the food.

The lecturer briefly discussed the principal chemical constituents and varieties of foods, under the following common headings:—

1. Nitrogenous foods—as butcher's meat.
2. Hydro-carbons, or fats—as butter and lard.
3. Carbo-hydrates—as starch and sugar.
4. Salts—as Chloride of Sodium (table salt.)
5. Water.

Common usage, common sense, and personal experience, he said, are the guides which most of us adopt in choosing and varying our dishes at meals, and, if we are wise, we don't go far wrong. Three meals a day, with an interval of about five hours between them, was probably the most suitable arrangement for most people. Regular hours for meals should be observed. Automatic acts like digestion, it must be remembered, acquire habit, like voluntary acts, and irregularity of meals was doubtless a fruitful source of indigestion.

Dr. Boobbyer spoke at some length upon the subject of cookery, and said that the difference between good and bad cooking meant not only the difference between economy and waste, between pleasure and disgust, but also, to many sensitive natures, between health and the opposite. He showed how many of the things that we now eat, and digest, and relish could not be eaten at all if uncooked. The most important bread-producing cereal, wheat, for instance, was one of these things. He spoke of the good educational work which Cookery Schools, and other like establishments, had done and were doing in most of our large towns, and mentioned some excellent current literature upon the subject of cookery, which was now sold at a very low price. He contrasted the proper and improper methods of cooking various food stuffs, and the respective values of the results to the animal economy.

Before any mass of meat was cooked, he said, the albumen on its surface should be coagulated by the application of intense heat, so as to retain the juices in the interior, the subsequent cooking being completed at a lower temperature. The same rule applied, whether the meat were to be cooked by boiling or roasting. The coagulation of the surface albumen could be readily effected by dipping the meat into boiling water for a few minutes before the true cooking commenced.

Meat already cooked, which was to be warmed up again, should never be exposed to more heat than was necessary to warm it through. Gravies and soups should be prepared at as low a temperature as possible. Vegetables should never be boiled with soup. Potatoes should be placed in boiling water at the outset. All leguminous vegetables should if possible be cooked in soft water. The lime salts in hard water rendered a large part of them quite incapable of digestion. Facts like these could be readily learnt, the lecturer said, by those to whom a knowledge of them would be useful, if they were suitably taught and illustrated; but the perception of them did not come by intuition, or even by the most lengthy experience, if unaided by scientific knowledge. Hence the necessity for systematic instruction for those to whom the preparation of our food was entrusted.

Dr. Boobbyer stated that open fires were, from a sanitary standpoint, undoubtedly the best of all agencies for the cooking of foods, but they were very wasteful of fuel, and that, for this and other reasons, various closed ranges and kitcheners were commonly substituted, especially in large establishments. He alluded to the danger of slow combustion stoves, owing to the incomplete combustion of carbon in them, and showed how the danger from this cause might be obviated.

In speaking of preserved foods, he said that a great deal of excellent food, both raw and cooked, was sold in this condition at the present time. Colonial and other foreign meat of the best quality, both as meat and as food, kept from decomposition by exposure to a low temperature in transit, was imported and sold in this country at a very cheap rate. Various kinds of animal and vegetable foods, put up in hermetically sealed vessels and cases, were sold in this country, and for the most part might be eaten with safety. He alluded to the possible risk of metallic and ptomaine poisoning, and, with reference to the first, spoke of the advantage of glass vessels as compared with those of metal.

He spoke disapprovingly of the use of such preservatives as boracic acid and formalin for ostensibly fresh foods—as fish and vegetables. He said that such "pickle" was much more commonly used than the majority of the public were aware of at the present time. He had even known mushrooms to be preserved in carbolic acid solution, of such strength as to render them quite uneatable.

In concluding his remarks upon food stuffs, he alluded briefly to the various causes of unwholesomeness in butchers' meat, and strongly advocated the establishment of public abattoirs in all considerable towns. He described the systems in use in many countries on the Continent, and in a few towns in this country, where cattle market, abattoirs, and (cold) meat stores were commonly within one enclosure, and under the management and control of public officials.

In discussing the subject of beverages, he spoke at some length about the use of alcohol in health and disease. In health, he said emphatically, all sorts and conditions of men were undoubtedly better without it. One and a half ounces of absolute alcohol (represented by about three ounces of strong spirits) was the largest daily dose which an average adult could take without definite danger to health. Alcohol, however, even in moderate doses, was forbidden to those who would train either mind or body to the highest pitch of proficiency, for short or long periods. Persons, again, who had to suffer exposure to extremes of temperature, and especially to low temperatures, could not afford to take it at all. It was now strictly forbidden on Arctic expeditions. In disease, on the other hand, its utility—in stimulating a flagging heart, for instance—was undoubted, and only a small minority of medical men opposed its use for such purposes.

The partiality of mankind for the infusions of tea, coffee, and cocoa, and for many other things taken in liquid and other shapes in various parts of the world, was simply the expression in a less objectionable form of the same craving which led to indulgence in alcohol. Opium, Indian-hemp, betel-nut, guarana, kola-nut, coca, and our own domestic friend, tobacco, for instance, were not taken as either food or drink, but to stimulate the body, or raise the mind above the dead level of normal consciousness.

Tea and coffee infusions, he said, should be prepared by pouring boiling soft water upon the dry material in a non-metallic vessel already heated. Tea infusion should be poured off the leaves (into a jug or other vessel) after standing a few minutes. He warned his hearers against over indulgence in tea, coffee, or even cocoa, and against taking them in quantity at meals. Tea had its victims, as well as alcohol, he said.

Water, the lecturer said, was necessarily the basis of all beverages, and constituted three-fourths of our body weight The estimate of the amount of water required, per head of population in towns, varied with local conditions from 20 to 60 gallons, but Dr. Parkes' estimate might be taken as representing the average needs of an average urban population. This was as follows:—

Domestic supply	12	gals. per head.
Baths	4	" "
Water-closets	6	" "
Waste—unavoidable	3	" "
Total for house	25	" "
Municipal needs	5	" "
Trade	5	" "
Total	35	" "

Dr. Boobbyer gave an account of the public supplies of certain towns, and contrasted the purity and plenty of the water of Glasgow, Manchester and Liverpool, derived from Loch Katrine, Thirlmere, and Vyrnwy Lakes respectively, with the comparative impurity and scantiness of that of London, seven out of the eight water companies of which delivered river water that required much filtration before it was at all fit for use, and was in some cases supplied on the intermittent system. He described the action of the ordinary sand filter and the function of the nitrifying organisms, and mentioned the Leeds Waterworks' filters as examples of the most improved and modern type of filter. He shewed how natural underground reservoirs were formed by percolation of rain, and how surface springs were simply the overflow from these. He pointed out the objection to the use of rain water, especially in populous places, and went on to discuss the various sources of water supply in outlying and rural districts, and the best means of guarding against their pollution from various causes. Pump wells were preferable to either dip or draw wells, but tube wells (*e.g.*, Norton's Abyssinian tube) were the safest means in ordinary rural districts of rendering underground water accessible (without risk of pollution) at the surface. The tube was driven in successive lengths (screwed together) through some impermeable upper stratum into the water bearing layer beneath. In this way, he said, a pure and constant service of water could often be insured, in regions where any water gathered at the surface would be altogether undrinkable.

He discussed the use of hard and soft waters for trade and domestic purposes, and the disadvantages arising from each. He alluded to the occurrence of cases of lead poisoning in certain towns in the North of England, from the action of moorland water upon the lead of the delivery pipes, and shewed how this might be obviated by using iron pipes, by lining the lead pipes, or by adding lime to the water before delivery (as at Sheffield). He mentioned several methods for softening hard water, and said that one method—that of adding about six grains of alum to each gallon of water—served at once the double purpose of softening the water, and of removing from it all suspended organic and mineral impurity. The principal diseases, in this country, conveyed by impure water, were, diarrhœa, cholera, dysentery, and enteric fever. He advocated the boiling and subsequent aëration of all suspicious waters, but deprecated the use of domestic filters, unless the Pasteur-Chamberland variety were chosen.

In referring to the topic of ventilation, he said that there was probably no hygienic subject of importance respecting which the majority of people had more dangerously mistaken ideas. Many people who were content to breathe fresh air (*i.e.*, the quality of air their lungs were made to breathe) outside their houses, had a rooted objection to do so within their houses and other closed spaces, and especially during the night. He gave the composition of ordinary atmospheric air (approximately 21 °/₀ O, and 79 °/₀ N, with four parts per 10,000 of CO_2, and traces of NH_3 and other impurities), and indicated how this composition was modified by respiration and exhalation. He showed how an ordinary adult required 1000 cubic feet of room space, allowing for ventilation equal to three complete changes of the contained atmosphere in each hour, if dangerous pollution of the latter were to be avoided. He then went on to demonstrate that, among the working classes at any rate, only a small fraction of this allowance was provided, either in home or factory. He further reminded his hearers how the afore-mentioned antipathy to fresh air led many people to curtail even the moderate amount of ventilation provided in home and workroom, by stuffing up all fresh air inlets. He instanced examples of extraordinary pollution of atmosphere occurring in places of public assembly and resort, such as law courts, theatres, and music halls, at the present day, but thought that about the best every-day example of the foolish lengths to which the fear of fresh air in motion would sometim[illegible] the average Briton, was to be found in the third-class smoking carriage on a railway, with its full complement of passengers (five aside), and both windows and all ventilators closed. As a Kiplingesque writer in the *Daily Chronicle* had put it:—

> "We arsts ourselves with pyne,
> Is this box o' stinks a tryne,
> Or a hopticle delushing hov the heye?"

He gave examples from his own experience of the benefit derived by patients suffering with such diseases as phthisis, pneumonia, and small-pox, from exposure to fresh, pure, and even very cold air moving freely, and urged his hearers to bear in mind that pure air was quite as necessary for their well-being as pure water and pure food.

Dr. Boobbyer next referred to the subject of drainage, and the disposal of refuse. He said that house refuse was naturally divided into liquid and solid. The liquid should embrace all excreta, as well as slops, and water used for washing purposes. The solids were made up of ashes and other inorganic material, and animal and vegetable débris. House drains were devised to carry away from the house, as promptly as possible, all the liquid, and a great deal of the solid filth produced within and about it. He sketched an ideal system of house drainage, and showed particularly where disconnections should be made and ventilation provided. Drains should be so laid, he said, as to allow of no leakage of any part of their contents in any direction. He dwelt at some length upon the subject of closets, and stated that the ordinary w.-c. of the modern pattern was infinitely preferable to pail-closets, midden-privies, slop-closets, or latrines. He briefly contrasted the incidence of typhoid fever upon houses with different types of closets during the past ten years in his own town, and showed that it was by far the greatest upon privy and pail-closet houses.

Not the least reason, he said, why town life was less healthy than life in the country was, that town people did not sufficiently object to the accumulation of dirt, or (refuse) "matter in the wrong place," in their vicinity. Not only did offensive emanations from fæcal deposits increase the impurity of the atmosphere, already polluted by overcrowding of population and by trade processes, but foul deposits themselves afforded a nidus for disease and other germs, which were often highly inimical to human life. Enteric fever, cholera, and diarrhœa, particularly, were actively propagated by such agencies.

Ideal public scavenging, he said, aimed at the daily removal of refuse from the vicinity of dwellings, although the practical difficulties in the way of attaining such an ideal in a big city (like Leeds, for instance) might seem to some of them insuperable.

In conclusion, Dr. Boobbyer said that he had intended to discuss other matters, but found that he had already exceeded the limit of time allotted to his lecture. He must, however, give his hearers a parting exhortation. The science of hygiene and public health was not founded upon fads and fancies, but for the most part upon solid facts; and, if the public were wise, they would support those public men and public bodies whose policy and practical endeavour, in the light of its teaching, were directed to secure the best conditions of life, both moral and physical, for the communities they were elected to serve.

Economy was a good thing, he said, though we sometimes heard too much of it, or what passed for it, especially at election times. To cut down the rates was a good thing in its way, but to cut down the death-rate was another, and a very much better thing.

CONGRESS AT LEEDS.

SECTION I.

SANITARY SCIENCE & PREVENTIVE MEDICINE.

PAPERS AND DISCUSSIONS.

"*Disinfectants*," *by* J. SPOTTISWOODE CAMERON, M.D., Leeds.

Dr. Spottiswoode Cameron explained that at short notice he found himself down to open a discussion on disinfectants generally; the alternative being that no general discussion on the whole subject would take place. For the sake of bringing such into order he therefore consented, at two days' notice, to open the present debate.

He said he should deal more particularly with the way in which they tried to deal with infectious diseases in the matter of disinfection in Leeds. Medical officers had, generally speaking, to deal administratively with the subject of disinfection, but there was now a large and, fortunately, increasing army of men who were able to deal in the laboratory with these processes which Medical Officers of Health had to put practically into force. It was to them that medical officers largely looked for guidance in the selection of the agents which they employed. They were waiting for their lead and he was in hopes that some of the gentlemen doing laboratory work would take part in the present discussion. He might first point out the kind of thing which medical officers wanted to do. They might roughly divide the infectious diseases, in dealing with which they employed disinfectants, into two classes;—diseases like small-pox and typhus, where the principal danger was that of catching the malady from someone else—where the infection went from person to person in the epidemic form; and, secondly, diseases such as typhoid and, probably, cholera, where the poison was more localised, where the danger lay more or less in the secretions or excretions of the body.

He was aware that this was not a scientific definition, but all the same it was a popular one to some extent, and from a practical point of view a convenient one. They had in many cases to combine the disinfection of both classes. They had in almost every case to consider personal infection, and they had to consider it much more carefully in regard to small-pox and typhus than in regard to typhoid and cholera. On the other hand they had to disinfect the evacuations probably in every case even of scarlet fever, but still more in cases of typhoid and cholera than of scarlet fever and measles. Therefore to put it roughly he might say there were two classes of diseases which they had specially to attack. Now in diseases like typhus and small-pox it has always seemed to some of them that the most important things to attack were the garments of the patients, and the same remark applied to scarlet fever. It was not so much that there was nothing to be dealt with in the evacuations, but it was absolutely necessary that they should get hold of the clothes and disinfect them.

They could disinfect clothes in two ways. They could reform them altogether;—burn them up and get rid of them. That was the way in which small-pox was dealt with to a very large extent in Yorkshire in some of their smaller districts. Only that was not, strictly speaking, disinfection. Fortunately they had an agent which was capable of absolute disinfection of diseases due to bacterial organisms;—of absolutely destroying the life of these organisms. That agent was heat. The question arose of how they were to apply that heat, and there they had been greatly helped by the investigations of Koch, and by the masterly exposition of the subject by Franklin Parsons in the report of the Local Government Board. They had the assistance of a man like Washington Lyon, who had taken the trouble to invent a machine which in a very large measure carried out the conditions they wished for; but there were, he was afraid, one or two little difficulties about the question of the application of heat by means of steam which they were in danger sometimes of overlooking. If they put a coat saturated with the poison of scarlet fever or small-pox into a chamber in which steam was being developed from water, and the steam under a pressure of, say, ten or fifteen pounds was allowed freely to escape into that chamber, there was no doubt if they gave it a reasonable amount of time, say fifteen minutes, they should destroy the bacteria if there were any, in that coat. But if they took the water away and had only the steam, and if, then, in order to be doubly secure, they raised the heat and super-heated the steam, then they were in danger of producing no result in the way of disinfection whatever. They were in danger, from their desire to do the thing very thoroughly, of not doing it at all.

The point they had to consider first was the selection of apparatus, and, administratively, the way in which it was worked. He was not saying anything against the excellent apparatus of Mr. Washington Lyon, but if they used any apparatus in which they employed steam they must guard against superheating it. Mr. Washington Lyon's apparatus could be made to disinfect thoroughly well, but they had to warn the workmen, so that in their zeal to destroy everything thoroughly they did not really produce a gas instead of a vapour,—a gas which had little or no conducting power, instead of a vapour of high conducting power like saturated steam. Then of course it was necessary—and this he need not enlarge upon—to take their infected material in one van to the disinfector, and to have a separate set of men and a separate van to carry it back. These were elementary considerations, but they knew the need on all occasions of observing such precautions.

In regard to typhus and small-pox, if they did their disinfecting carefully by steam under pressure they had probably destroyed the poison in the clothing. What were they to do with the house? In Leeds a short time ago when they had an outbreak of small-pox they did this; they emptied the house. They took the people up to some cottages which they had on their new estate at Manston Hall—the site of their future hospital, which they would, most of them, see during the Congress—and isolated the families in these cottages. They dealt with the clothes of every one of these persons in the same way that they dealt with the clothing of the sick person, and they destroyed any possible infection there might be in the clothing. Then as they had these people under the hand and eye of the medical officer of the hospital they were able, in a great number of cases, in even the majority of cases, to persuade them to undergo re-vaccination or vaccination for the first time. In that way they did an enormous amount to limit the spread of small-pox. As to the house itself they emptied it; they stripped it of all its paper, and dealt with the walls in various ways according to the circumstances. In some cases, where the walls were of the kind they saw in that room (painted or wainscotted) they washed them with a solution of Corrosive Sublimate, of 1 part in 500, sometimes using 1 in 1000. After that had been allowed to remain for a time they washed it off. In other cases they employed lime-wash. Their object was to get the original coat off the walls and to leave a perfectly clean coat.

Then there came in a very debateable point. In the majority of cases they put a pan of burning sulphur in the middle of the room, shut the windows and doors, and allowed the fumes to escape into the room. He was not prepared to say that it did any good; he was quite certain it did no harm. The question was, why did they do it? From the time of Homer it had been the practice to burn sulphur in cases of infectious disease, and if they had omitted to burn sulphur, it would have been supposed they had not read their Homer properly—an accusation they did not care to have brought against them.

He thought there was one advantage in burning sulphur in a large number of cases in which, say, typhus occurred, and they had had one or two in Leeds. The sulphur created such a horrible stench in the place, that before the people could use the house again they were compelled to open the doors and windows. It was all very well for their inspectors to open the windows; as soon as they departed the people closed them again. If, however, they had burned a sufficient amount of sulphur they would have to open the windows more or less for a day or two, and would admit a certain amount of oxygen. He was not prepared to say that was the only thing that sulphur did. He thought it quite probable that the reducing influence of sulphur dioxide did something in the way of breaking up the organic material covering the walls of houses that were over crowded and making it less fit for food for the bacteria, and consequently starving them out. At any rate they thought that, as Homer recommended it, they had better go on using it in the meantime. They knew of no strong objection to it, and especially in cases of typhus they considered it useful.

He now came to personal disinfection, and there they were in a difficulty as to what material to use. This was one of his greatest difficulties personally. What chemical substance were they to use to destroy bacteria in a typhoid case? They used about the weakest in Leeds; they used Carbolic Acid. He admitted it was a weak one, but then they used a good deal of it. They did not attempt to disinfect their drains with it. When a case occurred in a house, the first thing they did was to send a man with a hose-pipe to flush all the drains in the neighbourhood, so that, if anything had got into the drains before they heard of the case, it might at any rate be carried down to the sewage works with as little loss of time as possible. They ascertained whether anything was wrong with the drains, and then, if they did not send the case to the hospital, they supplied a large tub, painted green, which they placed in a particular position selected by the Inspector, and they instructed the persons attending to the sick person to put everything that came from the patient into that tub. The tub had an air-tight lid fixed with a spring, so that everything which went into the tub, that was likely to do harm to anybody, could, by the solution, be disinfected. They gave a printed form to the attendants instructing them how to deal with the motions that came from the patient at the time, and in this respect there were one or two points which they insisted upon strongly. In the first place, the solution of the disinfectant must not be too weak; in the second place, it must not be too strong. The action of the disinfectant they used—Carbolic

Acid—or of Perchloride of Mercury, was more or less to coagulate albumen, and if they had coagulated albumen outside the material they wanted to disinfect, the disinfectant never got inside at all; consequently they did not make it too strong. They allowed it to be sufficiently weak to soak into the material to be disinfected, and to do its work there. Why did they use so weak a disinfectant as Carbolic Acid? One reason was this: they could get it, in an impure form, of guaranteed strength in Phenols, at a very low price, and they could ascertain whether they were receiving the quantity of Phenols they were asking and paying for. There were more powerful disinfectants, but most were dearer. It was not necessary to have pure Carbolic Acid in order to disinfect; it did not very much matter, if they had the higher Phenols. Probably the higher Carbon Phenols were better disinfectants than Carbolic acid itself; so that, if they were the impurities, nothing was lost. If therefore they measured their disinfectant by its value as containing Phenols, they gained quite as much as they lost by impurities. There were other disinfectants in the market.

The great difficulty he personally had found was to ascertain what these were, how they were to gauge them; and to know that the strength of the samples which had been submitted to the bacteriologist for examination was the same as they would obtain in the market. He did not mean to say that manufacturers of Izal would willingly or knowingly palm off an inferior article upon the public, but how did they know themselves that they were sending out the same material they sent out, say, six months or two years ago. He believed with all the care they took there was a certain amount of risk of their being, at some time later, with the improvement of chemical processes, in danger, if they used some of these more powerful things, of finding they were not as powerful as the specimens. That was where he hoped Bacteriologists would come to their rescue, and provide them with some efficient means of testing by some standard method the strength, the bacterium destroying strength, of numbers of disinfectants they were using. There was Chloride of Lime. Its Chlorine was a measurable quantity, and it was only lately they had had impressed upon them the enormous advantage of using Chloride of Lime, or some Chlorine Compound such as Chloride of Soda, or some analogous Compound containing Chlorine and the feebler Oxides of Chlorine. Experiments had recently been made showing how very powerful this was if applied in liquid form to wall paper. There was this enormous advantage in a thing like Chlorine, that if they once got a sort of index between its bacteriological power and its oxidising power all they would have to do, if that were a fixed quantity, would be to measure the

Oxidising power, which was very simple. He should like light upon this point if Chemists or Bacteriologists could give it. Was there any relationship between Chemical reducing power and the power of destroying Bacteria? Was there any definite relationship between oxidising power and the power of destroying bacteria? And then, further, could they give them, having regard to this killing power, products easily measurable as to strength and affording the definiteness they required, in order that they might know that they were dealing at all times with practically the same thing? He was quite willing, as he had said, to believe the word of these manufacturers, whom he believed to be honest men, but how were Medical Officers to know that changes, or attempts to improve Chemical processes, did not give them, in regard to Bacteria-destroying properties, something which was really inferior to the sample originally submitted to bacterial examination. A mere statement of the boiling-point or the density, or even of both together, was not a sufficient identification of the substance. They were greatly indebted to chemists and manufacturers for what they were doing, but he wanted definite means of comparison and identification.

[*For discussion on this paper see page* 419.]

"*Disinfection*," *by* PROFESSOR S. DELEPINE, M.B., C.M.

PROFESSOR DELEPINE said, having unexpectedly been asked to speak on this subject, he would limit what he had to say to personal experience. He had had, during the last five years, frequent opportunities to study disinfectants and disinfection generally, as applied in practice.

The subject was very specially brought before them in Manchester in 1892 on an occasion when the necessity of disinfecting houses that had been occupied by patients dying of tuberculosis had to be considered. Dr. Tatham at first wished to try disinfection by chlorine and by sulphurous acid in the usual way, and he (Professor Delepine) had to test the results obtained. This was done in a very simple manner. Large drops of typical tuberculous sputa were dried on pieces of paper and placed in various parts of the rooms to be disinfected. These were placed in vessels which prevented accidental contaminations after the disinfection had been completed. They were then brought to the laboratory and their activity tested by inoculation.

It was found that sulphurous acid was perfectly harmless so far as the bacillus was concerned. The tuberculous matter resisted the effects of exposure to sulphurous acid for a very considerable length of time, and showed no marked loss of vitality or virulence. Even dry chlorine produced very little more effect in the quantities and under the conditions observed in the ordinary practice of room disinfection, as carried out at that time by the authorities.

It became evident that sulphurous acid and chlorine were practically useless under these conditions, and the author suggested to Dr. Tatham the use of a solution of some hypo-chlorite. No doubt chlorine in itself was a very powerful disinfectant, but it required the presence of moisture, and it seemed that the simplest way to generate chlorine rapidly, on the spot where it was wanted, was to employ a solution of some hypo-chlorite, which would generate chlorine and at the same time supply the water wanted.

He suggested the use of a weak solution of the cheapest of all hypo-chlorite, that was hypo-chlorite of lime. It was not necessary to use it in a pure state. Ordinary bleaching powder was quite suitable for the purpose. It was found that when bleaching powder was mixed with water and allowed to stand for a few hours a solution of active hypo-chlorite mixed with other salts was obtained.

If a weak solution, made with about one part of the original chloride of lime and 100 parts of water, was applied to the walls or to any paper impregnated with tuberculous matter, thorough disinfection was obtained in a few hours. Disinfection was invariably obtained in that way and, in fact, an exposure of a few minutes was generally sufficient, even with a weak solution like the one he had mentioned, when the layer of virulent sputum was not very thick.

The solution was very easily prepared. Bleaching powder could be bought by the authorities in the dry state, could be mixed with water when wanted, the fluid could then be decanted if a clear fluid was desired, and the solution was ready for use.

It was impossible to find a cheaper disinfectant or one in which it was easier to secure what Dr. Cameron wanted as a necessary element of success, viz.: a definite proportion of the active element present. The one per cent. solutions damaged papers, metal fittings, etc., to a very slight extent indeed, the mechanical action of the brush, and the dirt on the wall, being the chief sources of discolouration.

These experiments with tuberculous sputa led Professor Delepine to try the action of hypo-chlorite of lime on various other germs than the tubercle bacillus, and as was expected from the results obtained by many observers with damp chlorine, it was found that every germ tried was rapidly destroyed when brought into contact with a ten per cent, or even one per cent. solution of chloride of lime.

Dr. Woodhead had also made many experiments on disinfection, and he would be able to bear out what the author said.

Anthrax spores placed for a few minutes in such a weak solution as that he had just mentioned were killed. In the presence of results of this kind one was hardly justified in using other disinfectants, when it was possible to use chlorated lime.

There was one strong objection to the use of this solution. Hypo-chlorites when applied to walls in weak solutions generated chlorine so rapidly that the disinfectors found difficulty to remain in a room while disinfecting it. He once shut himself in a room *with every opening closed* and went through the process of washing twice the walls with a ten per cent. solution, without leaving that room. He found he could do it but was rather miserable for nearly a whole day afterwards.

It did not follow however that because the process was unpleasant to apply it should not be applied. Difficulties of that kind had been overcome before and there was no very considerable difficulty in overcoming this one. First of all he tried to disinfect the room after all the openings had been closed, simply to try the effect of the gas evolved upon himself, but the idea that it was necessary to close the room would be in practice quite erroneous.

There was no objection to opening the doors and windows widely as the evolution of gas took place very readily under those conditions, the presence of oxygen did not interfere with the evolution of chlorine. If there was a good draught in the room in which the solution was applied, disinfection could be carried out quite comfortably.

After completing the washing the windows and doors could then be closed to retain the chlorine evolved as long as possible in the room.

There was no objection to the disinfectors using a mask with which the eyes and the mouth could be protected, the first by adequate glass coverings and the latter by a respirator. He had obtained from a well-known factory, where bleaching powder was produced, a mask which he had found to be quite efficient.

On the grounds of cheapness, efficiency, and simplicity, he thought there was nothing equal to the solution of chloride of lime. If one was frightened by the difficulties he had mentioned, the best thing after chloride of lime was formaldehyde.

He had tried lately, on an extensive scale, the lamp devised by Mr. Richard and manufactured in Belgium, and had been highly pleased to find that he could generate a very large amount of dry formic aldehyde with one of these lamps and he had been able to thoroughly kill a number of bacteria, sporing and not sporing, exposed to its action in various parts of a large experimental room.

Yet there were a few exceptions which he could not clearly understand. The exceptions were cultures of the staphylococcus pyogenes aureus, and recent moist spores of the bacillus anthracis. These had seemed to be killed at first, but after several weeks they began to grow again, showing that their growth had been only temporarily inhibited. These results he had yet to explain by making further experiments.

A thing he could not understand was that bouillon cultivations of the bacillus anthracis, with very young spores, had resisted, where dry old spores did not resist.

As he was speaking on the subject of disinfection, he might say two or three words on disinfection by steam. When the subject was considered from a purely experimental point of view, it became ridiculously simple. Steam, at a temperature of 100 to 102°c. generated extremely rapidly, and, passing in a rapid current over any object to be disinfected, would disinfect that object in an exceedingly short time. It was sufficient to generate steam under a very low pressure (rapidly, so as to obtain a very bulky current,) to produce exactly the same results, with very simple apparatus, as could be obtained with more complicated apparatus, in which there were means of superheating the steam or of obtaining a high pressure. He had made experiments (with a sufficiently large apparatus to render the results practical), which left no doubt as to the relative value of current steam under low and high pressure, confined and superheated steam, and steam mixed with air. He had found that current steam, under low pressure, and free from air, produced complete disinfection so rapidly that nothing more was required in practice. The essential point was to obtain a rapid passage of saturated steam through the disinfector. This was accompanied by a rapid displacement of air from the apparatus, provided a large outlet was provided. A small amount of pressure was necessary to ensure the proper regulation of the temperature and current of steam, but an excessive amount of pressure was absolutely unnecessary, and made the displacement of air more difficult.

[*For discussion on this paper see page* 419.]

"*The Disinfection of Rooms by Formic Aldehyde Vapours*," *by* HENRY KENWOOD, M.B., D.P.H., F.C.S., Assistant Professor of Public Health, University College, London; Medical Officer of Health, Stoke Newington.

(FELLOW.)

(*With a Bacteriological Report by* H. J. CURTIS, F.R.C.S., Assistant to the Professor of Pathology; in charge of the Bacteriological Department, University College, London.)

LAST year I collected the evidence furnished by a population of over a quarter of a million, proving that SO_2 disinfection of rooms very rarely breaks down in practice—even when we adopt the view that all further cases of infection which occur on the same premises within a short period of fumigation are invariably due to imperfect disinfection of the rooms, and not, as may sometimes be the case, to the several other possible causes which suggest themselves. I also showed that the satisfactory results, which are observed in practice from this form of disinfection, are in accordance with those which can be achieved by experiment with the diphtheria bacillus, and this fact has received further corroboration by the independent work of others during the past twelve months (Wynter Blyth, Rideal). There can be no gainsaying that the infection of the Infectious Diseases, which we have commonly to deal with, is very easily destroyed under the ordinary circumstances of its existence apart from the human body; and that this matter of disinfection has been made to appear a much more difficult task than it actually is, from the circumstance that, in experiments, disinfectants are asked to accomplish a great deal more than they would ever have to do in actual practice. In ordinary practice we probably have to deal with non-spore-bearing bacteria, and of comparatively easy destructibility, and these bacteria do not find at their site of lodgment anything approaching the fostering and protective properties of the nutrient media in which they are planted in experiments.

By experiments with the more resistant organisms—which, by the way, are not sought to be destroyed in the ordinary practice of room-disinfection—it can be shown that surface disinfection by sulphurous acid gas is not so reliable as that by chlorine, vapourised phenol, or a spray of perchloride of mercury. In my paper, last year, I gave some reasons why I considered the adoption of the spray method undesirable, and likely to prove in practice less satisfactory than the use of SO_2;

since then my opinion has received some justification from the work of Lemaire, who has experimentally demonstrated how micro-organisms may and do escape destruction by this method. A great deal has been claimed for the spray method in France, but nothing, so far as I am aware, has been adduced in support of its never-failing efficacy in actual practice; and I have endeavoured myself—but unsuccessfully—to get any such evidence from the Authorities. I do not believe that the man could easily be found, who would conscientiously go over every square inch of surface in every room he was asked to disinfect, and if every inch is not sprayed the measure must fail in its ends. The same objection applies to the official German method. The disadvantages attending the use of chlorine are well known to you.

But the satisfactory results, which have been obtained by experiment from the vapour of formic aldehyde as a disinfectant of rooms, are very striking, and warrant due consideration at the hands of us Medical Officers of Health.

The literature on the subject of the disinfecting powers of formic aldehyde is already considerable and it is growing apace, but I believe the bibliographical note which I append to this paper includes practically everything which has been published; and the conclusions, which I shall express with reference to the disinfecting powers of these vapours, are arrived at by a careful weighing of the evidence offered by these many workers on the subject and by a few experiments of my own.

Now an al-de-hyde is an alcohol *de-hyd*rogenated, and as a rule an alcohol is transformed into aldehyde when it loses two atoms of its hydrogen. Thus wood-spirit (methyl alcohol) (CH_3OH) when deprived of H_2 becomes $CHOH$, called formic aldehyde, because it very readily changes to formic acid ($CHOOH$). The aldehyde vapours, which are irritating to the eyes and throat, are doubtless a powerful disinfectant, and so far as their application to the purpose of the surface disinfection of rooms is concerned, the following conclusions may be accepted as amply warranted:—

(1). That when the atmosphere is charged with less than 1 $^0/_0$ of the vapour, the disinfection of all surfaces is complete and rapid, and that this holds good under the ordinary conditions of temperature and moisture obtaining in living rooms.

(2). That the vapours possess a certain and variable amount of penetrating power into loose fabrics, especially when these are dry. This penetration is largely due to the circumstance that when produced in a warm state the vapour is of a low specific gravity and mixes well with the air.

[These facts have been proved by numerous experiments by different workers, in which the following objects were exposed:—The specific organisms of cholera, enteric, diphtheria, tetanus, tuberculosis; B. coli communis, B. Anthracis with spores, Tricophyton spores, Staph: pyogen: aureus, phthisical sputum, dust, soil, &c.]

(3). That the vapours do not affect the colours of textile materials, &c., or (with the exception of iron or steel) metallic surfaces.

(4). That the room, and articles exposed, can be cleared of the vapours readily by sufficient aeration, and the vapours are not so irritating but one can always enter the room and unseal at the first attempt (an advantage over SO_2 and Cl_2).

(5). That the disinfecting properties of the aldehyde are greater than those of SO_2 or Cl_2.

(6). That there is no danger in entering the room, either from the aldehyde, or from the CO which is formed at the same time. This is proved from the fact that the men employed in the works and exposed to considerable quantities enjoy good health, and also from many experiments with animals in atmospheres heavily charged with the vapours generated, as in room disinfection.

A simple way to generate the aldehyde is to allow the vapour of wood alcohol, well mixed with air, to pass over the surface of red-hot platinum (Hoffman); and accordingly many lamps have been devised, upon this principle, to generate the aldehyde for the purposes of room disinfection. Tollens, Gambier, Bartel, Brochet, De Schweinetz, Trillat, Dieudonné, have devised such lamps, but they do not generally admit of the formation of sufficient quantities of the aldehyde in a sufficiently short space of time to make them acceptable for ordinary room disinfection.

Krell, Robinson, and Kinyoun have devised the lamps which appear to be the most suitable for this purpose. In most lamps the alcohol vapours, well mixed with air, are conducted over a red-hot platinised surface, the alcohol becoming converted into aldehyde and water; and a certain amount of CO also developes.

The lamp which I have had made for the purpose of my experiments is very similar to Prof. Robinson's (of Brunswick, U.S.A.); it consists of a well of from 1—2 litre capacity into which methyl alcohol is placed, and a hollow cylinder fits firmly on to this—the top of the cylinder being brought to a short funnel so as to encourage a draft. In its lower part the cylinder is perforated for the free admission of air, and just above the perforated part, and inside the cylinder, a narrow shoulder projects which is for the purpose of supporting a disc of extra hard pressed asbestos mill-board, perforated in many places, and platinised by soaking in a solution of platinic chloride in alcohol and then burning off the alcohol until platinum black results. In practice, the requisite amount of alcohol in the well is first ignited, and then the top part of the lamp is removed and the flame extinguished by placing some object (as a lid) over it; when the top part of the lamp is replaced the alcohol vapours come away actively, mixed with the air drawn through the perforations, and in passing through the platinised asbestos keeps it in a red glow until all the alcohol has evaporated.

It is most generally recommended that with these lamps about two litres of alcohol is sufficient for rooms of 3,000 cub. ft. and about six hours exposure should be given. The cost for disinfecting an ordinary room would be about 2s. 6d.

Bartel's apparatus is one of the most simple, and no platinum is used; it is similar to a kettle; and indeed an ordinary kettle would serve the purpose. The methyl alcohol in the receiver is warmed and the spout is heated by an alcohol flame placed underneath it, until the vapours of alcohol which issue from the spout are ignited; so soon as this takes place the flame is extinguished and the partial oxidation of the alcohol vapours to aldehyde begins in the heated spout.

A 40 per cent. solution of formic aldehyde in water is known as "Formalin," but when this solution is heated the aldehyde becomes largely polymerised into a whitish amorphous substance which gives off slowly but very little aldehyde; the vapours, therefore, cannot be generated in sufficient quantities by heating large quantities of "formalin."

In the Oppermann-Rosenberg apparatus a fluid called "Holzine" is evaporated on an asbestos plate by means of a few pieces of glowing coke. This "Holzine" is a methyl alcohol solution of formic aldehyde, containing about 60 per cent. of the aldehyde and possesses the obvious advantage over "formalin" that considerably less material is required, and it is said that no polymerisation takes place.

The polymerised formalin (trioxymethelene, $C_3 H_3 O_3 H_3$), which results from a simple evaporation or heating of formalin, is also known as "paraform": it is a very stable body and the substance has been cast into tabloids and sold by the Formalin Hygienic Company along with a lamp so constructed that when in use the products of sublimation of the paraform, which would be otherwise chemically inactive, meet the products rich in moisture resulting from the burning of a small separate methylated spirit lamp, and thereby a considerable amount of aldehyde vapour is furnished. It is interesting to note also that it is claimed that the aldehyde from one or two tabloids of paraform thus treated in a sick-room, has a considerable therapeutic value; it has been employed abroad apparently with some success, in catarrhs, diphtheria, bronchitis, asthma, phthisis, influenza; and I can myself testify to the fact that it has acted beneficially in cases of whooping cough. A small flame under one or two tabloids does not give rise to sufficient aldehyde to prove irritating and the irritating properties of larger quantities of the vapours can be almost entirely removed by the use of small quantities of menthol.

For disinfecting purposes ten tabloids are directed to be used to 1,000 cubic feet of space, and six hours exposure given. The cost of disinfecting an ordinary room would be about sixpence.

Finally, the aldehyde may be liberated from "formalin" by Trillat's new apparatus. The 40 per cent. solution of formic aldehyde is heated under pressure in an autoclave provided with a pressure guage and a thermometer. A little chloride of calcium is placed in the solution, and as the boiling point of the calcium chloride solution is well above 100° C., and the gas comes away below 100° C., practically the whole of the aldehyde (fairly pure and dry) is given off before the water comes away as steam. The apparatus needs attention, and so it is placed outside the room; the solution is heated in the autoclave by means of a Swedish petroleum lamp, and when the pressure registers 40 lbs. the vapours are allowed to escape through a long, thin, copper tube, which is placed through the keyhole into the compartment.

The apparatus costs about £18, and the disinfection of an ordinary-sized room would cost about 2s. 6d. Half-an-hour is required to get up the necessary pressure, and then the vapours must be allowed to escape into an ordinary-sized room for half-an-hour, and for an hour in a very large room. About 1·5 litre of formalin is recommended for about 3000 cubic feet of space, but doubtless less than this would suffice; more than the litre-and-a-half of formalin has to be employed in the autoclave, however, to guard against injury by drying up, &c.

Conclusions as to the relative efficiency and advantages of the different methods of charging rooms with formic aldehyde vapours.

(1). The simple evaporation of solutions of formic aldehye into a room are inefficient, as a large proportion of the gas is polymerised into trioxymethelene, which only gives off (slowly) a very little aldehyde.

(2). The results of experiments with different methyl-alcohol lamps have varied with different workers, and sometimes even in the hands of the same worker; the disinfection of all the organisms employed was not *invariably* complete when the amount of material used in the lamp is that which has been recommended. It is probable that the whole of the alcohol is not changed to aldehyde by any lamp; and the variable results may depend in a measure upon this circumstance. It may happen that some of the alcohol is simply volatilised, or may even be converted into a higher state of oxidation.

(3). Trillat's is doubtless the best of all known methods of room disinfection by means of formic aldehyde; and it is specially suitable where passages, corridors, or stair-cases with communicating rooms, require disinfection at the same time. The vapours should be liberated at as low a point as possible, and they rapidly diffuse themselves over the whole area which it is required to disinfect. It is, I believe, the very best means at our disposal of disinfecting a room, so far as its efficacy against even the most resistant pathogenic organisms is concerned. The drawbacks to the employment of the apparatus, in our practice, are:—

The weight of the apparatus, and the consequent difficulty of conveying it to infected premises.

The extra time taken up in charging the room entails about one-and-a-half hours of a man's time, in respect to each room treated.

The reliance which will have to be placed upon the man who does the disinfection, *i.e.*, in charging the room *sufficiently*.

(4). Washings and sprayings with a 2°/₀ solution of the aldehyde are reliable, but are open to the same objections as the use of perchloride of mercury sprays. Such solutions are excellent for bed-pans, typhoid evacuations, tubercular sputum, &c.

So far as my own experiments are concerned they point to *further conclusions*:—

(*a*). That either of the two lamps which I selected* as the most suitable in practice, for room disinfection, would be found satisfactory in ordinary practice, but in special cases Trillat's method is to be preferred, on the score of its greater disinfecting power over the more resistant organisms.

(*b*). That with formic aldehyde vapours it is not so much a question of period of treatment (exposure) as of initial dose, and it is not necessary, in practice, to give six hours' exposure.

(*c*). That whereas in almost all experiments with Trillat's apparatus a minimum of six hours' exposure has been allowed, the same good results would have occurred from an exposure of half that time, and probably of less than that; with the lamps experimented with a four-hours' exposure, if not less, will suffice in practice.

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* *Vide* Appendix.

This question of the time consumed in disinfection is becoming more and more important each year in deciding on the adoption of any particular method of room disinfection in urban communities, for the houses are becoming more and more tenemented, and therefore more and more fully occupied, and the infected room is required for sleeping purposes the same night, with increasing frequency.

(*d*). That the objections to the general use of Trillat's apparatus *in our practice* are material, and unfortunately offer a serious barrier to its adoption.

(*e*). That of the two lamps which I believe to be efficient, the paraform lamp is by far the cheaper and the more convenient in use. In ordinary-sized rooms the requisite quantity of aldehyde is obtained from the "paraform" tablets in a little less than an hour, while the methyl-alcohol lamp requires half as long again in transforming the requisite amount of alcohol. I believe that one lamp is as efficient as the other.

(*f*) That whenever these aldehyde vapours are employed the room must be very thoroughly sealed, for, owing to the high diffusibility of the vapours, it is difficult to prevent some escape. When escape takes place, the aldehyde rapidly travels, especially upwards, through the house, and would cause discomfort and alarm to the occupants.

(*g*). That this tendency to escape from the closed room is considerably greater than it is with either SO_2, CL_2, or vaporized phenol.

APPENDIX I.

BACTERIOLOGICAL REPORT BY H. J. CURTIS, F.R.C.S.Eng.

Cultures employed.—Blood serum subcultures from a pure culture of Diphtheria on serum were made and incubated for twenty-four hours.

Methods.—(a) Sterile wool swabs attached to supports fitted into corks, were inoculated with the subcultures and replaced in sterile tubes.

(b) Sterile pieces of brown holland, one inch square, were placed in Petri-dishes and similarly inoculated with the subcultures.

(c) Sterile pieces of brown holland, one inch square, placed in Petri-dishes, were, after being inoculated with the subcultures, covered with a circular disc of sterile brown-holland, 1½ inches in diameter, to test the penetrating effect of the formic aldehyde.

After exposure to the aldehyde, or in the case of the control experiments, after exposure to the ordinary air for a similar period of time, in an adjoining room, the swabs were placed in fresh sterile tubes and the covers of the Petri-dishes were replaced, and the whole material was brought back to the laboratory for examination. For each experiment—

(a) Three swabs were rubbed over the surface of a serum subculture of a Diphtheria culture; two of these were exposed to the disinfectant and one was treated as a control; three other swabs were rubbed into a second subculture; and so for a third set of swabs, one of each set being used as a control and the other two being exposed to the aldehyde.

(b) Two single squares of brown holland were also inoculated from each of the three subcultures, one of the two in each case being used as a control.

(c) Similar squares, covered over with discs of brown holland, were treated in exactly the same way as the former.

EXPERIMENT I.

After the due exposure, the inoculated swabs and strips were returned to the Laboratory as rapidly as possible, and were rubbed into fresh serum tubes which were incubated over night at 37° C. After nineteen hours,* the following

RESULTS were obtained:—

1. *From all the control swabs and strips, including those covered by the circular discs of holland*, the diphtheria bacillus was found to have grown readily; some of the growths were practically pure, others were mixed with cocci, chiefly staphylococci.

2. *Of the test-swabs exposed to Formalin vapour, and the strips, including those covered by discs of holland*, similarly exposed to Formalin, not a single tube inoculated from the vapourised swabs and strips showed any diphtheria colonies, and only one strip gave rise to any culture at all, viz., a staphylococcus colony (verified by the microscope). This may have crept in after the Formalin vapour had ceased to act, before the Petri-dish cover was replaced, or perhaps during the transfer of the strip, in the Laboratory, from the Petri-dish to the fresh serum tube.

[*N.B.*—In this experiment Trillat's apparatus was employed in a room 2004 cubic feet capacity. The vapours of $CHOH$ were allowed to escape into the room for forty minutes; after this an exposure of three hours was allowed. The subcultures were placed on the floor, on chairs, on the mantel-piece, and on brackets, one of which was fixed just below the ceiling. At the end of three hours the atmosphere had a strong odour of C H O H. Many coloured materials were exposed (including terra-cotta plush, pale peacock blue silk, sage green silk, French-grey face cloth, butchers' blue cotton, electric blue cotton, yellow and orange velveteen, dark green plushette, &c.), and control pieces were reserved for purposes of comparison. It was impossible to detect the slightest evidence of fading. Bronze images and gilded frames were quite unaffected.—H. K.]

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* The short periods of 19 and 20½ hours are here given because Mr. Curtis generally furnished me with a Bacteriological Report on the result of the experiment of the preceding day, but in every instance where no growth is reported, the tubes were left in the incubator for at least a week and still remained free from any growth at the end of that time. H. K.
H. J. C.

EXPERIMENT II.

RESULTS after 20¼ hours' inoculation of fresh serum tubes at 37° C:—

1. *From cultivations made from the control swabs and strips of holland, the diphtheria bacilli were readily recovered in all cases.*

2. *In the case of the test-swabs, the single squares of holland and the strips inoculated and covered with circular discs of holland,* the serums remained sterile for days afterwards.

[*N.B.*—In this experiment twenty-one paraform tablets, of an average weight of about a gramme, were employed to disinfect the room of 2004 cubic feet, and the period of exposure was four hours. On unsealing the room the atmosphere had a strong odour of the aldehyde.—H. K.]

EXPERIMENT III.

RESULTS:—1. *From the control swabs and strips of brown holland,* cultivations on serum were made, and the Diphtheria Bacillus was easily recovered from all the cultures.

2. *From the test-swabs and strips of holland (both single strips and those covered by sterile discs of the same material)* an attempt to make cultivations of Diphtheria Bacillus on serum failed in all cases.

[*N.B.*—In this experiment the lamp which I had made for me was employed; 1½ litres of methyl alcohol was used up and the room (2,004 cubic feet) sealed for four hours. At the end of four hours the atmosphere had a strong odour of the aldehyde.—H.K.]

EXPERIMENT IV.

RESULTS, after inoculation of fresh serum tubes:—

1. *From cultures made from the control swabs and strips of holland,* the Diphtheria Bacilli were readily obtainable in all cases.

2. *The serums inoculated with the test-swabs* showed colonies of Diphtheria in two out of three cases—one of the three remaining sterile.

3. *The serums inoculated with the test single strips of holland* also showed colonies of Diphtheria Bacilli mixed with staphylococci in two out of three cases—one serum, however, remaining sterile.

4. *The serums inoculated with the three strips of holland which had been covered with circular discs of holland*, curiously enough, remained absolutely sterile after 72 hours incubation at 37° C.

[*N.B.*—In this experiment the lamp used in experiment III. was again employed, in a wooden building of 2,500 cubic feet internal capacity. A high wind was blowing and it was impossible to make the apartment fairly air-tight. After sealing up, the aldehyde could be noticed outside of the building. The object of the experiment was to see if the method could stand a severer test of imperfect sealing than is ever likely to occur in practice. At the end of four hours, the apartment was unsealed and there was only a slight odour of aldehyde perceptible.—H.K.]

APPENDIX II.

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[*For discussion on this paper see page* 419.]

"*Notes on the Examination of Disinfectants,*" *by* WOLF DEFRIES, B.A.Lond.

(MEMBER.)

IN the course of an examination of certain disinfectants I have obtained some marked confirmation of one or two principles affecting such examinations. These principles are not new, and in general terms I have myself drawn attention to their practical importance on other occasions. In the present instance, however, they have turned up to an extent sufficient, perhaps, to be worth recording.

The experiments in question were all done on a broth culture of the same organism, one of the subtilis group isolated from straw by half-an-hour's boiling, and growing freely with a characteristic pellicle and sediment. The infection was in each series done on the same day, and the treatment of all tubes was precisely comparable.

The first point which I find strongly confirmed is the need in such experiment to observe cultures for a considerable period. I extract the following examples :—

Disinfectant.	No. of Tube.	Period of Exposure (').	First grew on day.	Disinfectant.	No. of Tube.	Period of Exposure (').	First perceptible growth on day.
Hg Cl_2 1/1000	49	1	2nd	Formalin 1/80	89	1	2nd
„	50	1	5th	„	90	1	1st
„	51	1	4th	„	91	1	1st
„	55	1	4th	„	92	1	2nd
„	56	1	2nd	„	98	1	3rd
„	58A	1	3rd	„	103	3	2nd
„	59	1	3rd	„	107	3	2nd
„	60	1	4th	„	112	3	3rd
„	63	3	4th				
„	64	3	2nd				
„	66	3	4th				
„	67	3	4th				
„	68	3	2nd				
Control.	73	...	2nd				
„	74	...	2nd				
„	75	...	1st				
„	76	...	1st				

There appeared accordingly to be in some cases considerable retardation of the growth of the organism without destruction in the perchloride series, and occasionally to a slight extent with formalin. In a later series this occurred again; but on this occasion the formalin was the more dilatory, as the examples show.

Disinfectant.	No. of Tube.	Period of Exposure (').	First grew on day.	Disinfectant.	No. of Tube.	Period of Exposure (').	First perceptible growth on day.
Hg Cl_2 1/1000	220	2	2nd	Formalin 1/80	445	1	4th
„	223	2	2nd	„	446	1	3rd
„	224	2	3rd	„	447	1	2nd
„	225	2	3rd	„	448	1	3rd
„	226	2	3rd	„	449	1	3rd
„	228	2	3rd	„	450	1	2nd
				„	451	1	4th
				„	452	1	4th
				„	454	10	4th
				„	455	10	4th
				„	456	10	4th
				„	463	60	4th
				„	464	60	5th

In most of the formalin cases the development of the characteristic pellicle did not occur till some days later, in several instances as much as a week after infection of the broth. The controls were not watched day by day, but examined on the third day had grown. In a subsequent series with perchloride 1/500, and formalin 1/40, there was no appreciable retardation of the development of turbidity, but the formation of the characteristic pellicle was postponed in several cases in the case of the formalin, until as much as six days after infection of broth.

In all these experiments the vehicle of the infection was washed with a suitable antidote (ammonium sulphide for perchloride, and ammonia for formalin) after exposure to the disinfectant, and before being inoculated into the broth. I am, therefore, unable to attribute the retardation to antiseptic action of disinfectant carried over in quantities too small to actually disinfect. I do not think it likely to have arisen from the action of the antidote, as the results obtained in some other experiments with a very careful washing with water before inoculation were much the same. As a matter of routine, I also treated infected tubes with the antidote alone, and found no appreciable difference in the rate of growth of tubes made from these, and infected tubes made with sterile broth, although this, of course, is not conclusive as to the effect of the antidote on the growth of an organism already attenuated by attempted disinfection. I am not able to assign a limit beyond which growth need not be apprehended.

I have found some reason to believe that the method of examination by mixing infected broth and disinfectant to a given dilution of disinfectant does not give results comparable with those obtained from treating dry infection, and that the difference may be considerable. In two consecutive series made with perchloride 1/1000 with exposures on the method of mixtures for 20, 40 and 80 minutes respectively the organism was killed in every instance; with exposures of 1 minute not killed, with exposures of 5 minutes and 10 minutes was killed twice out of four times; and with exposures of 11 minutes killed both times. In the cases of the formalin 1/80 the organism grew every time, so that no basis for comparison was available. But when the perchloride was applied to dry infective matter (broth culture dried on glass thread, or as described below), the organisms repeatedly stood as much as 60 minutes' exposure. It becomes therefore a matter of question whether the dilution or the dry method is preferable. The dilution has the advantage of permitting a more uniform distribution of disinfectant and culture, and therefore giving a better basis for comparing a disinfectant under examination with some better known disinfectant. This is of the more importance because the accidents of variability in specimens of the same organism, and even of their adaptation to apparently similar culture media makes it a comparative statement as to their action the most reliable which at present can be made. On the other hand, the interposition of some natural protective film probably better corresponds to the conditions of practice, even in the case of apparently superficial disinfection. Up to the present I have proceeded by allowing a small measured quantity of infected broth to fall out of a capillary pipette on the bottoms of small sterile test tubes, the tube being lifted up so as to just touch the drop. This drop is then allowed to dry over the surface of the bottom, and application of the disinfectant, washing, and addition of broth takes place in the same tube. The process is convenient in working, and probably there is less risk of pollution or loss of organisms through washing than where glass threads are used.

I should add, in apology for the somewhat incoherent nature of this paper, that the main object of the experiments in question was to determine points other than those to which I have referred, on which unfortunately they have so far led me to no definite conclusion.

[*This discussion applies to the papers by* Dr. J. S. CAMERON, Prof. DELEPINE, Dr. H. R. KENWOOD, *and* Mr. WOLF DEFRIES.]

DR. SIMS WOODHEAD (London) said that some time ago he had the opportunity of carrying out a number of experiments with various disinfectants—perchloride of mercury, iodide of mercury, and others which it was scarcely necessary to mention. He should confine what he had to say almost entirely to the "chloride of lime" and formic aldehyde, because these two were at present the special forms of disinfectants that were occupying the attention of Medical Officers of Health and those who were specially interested and experimenting in this question. After what they had heard from Dr. Cameron concerning carbolic acid, it certainly was not necessary for him to go into the use of carbolic acid as a disinfectant. As to hypo-chlorite, he had, along with his colleague, Dr. Cartwright Wood, made a large series of experiments with Hermite fluid, which was really a weak solution of hypo-chlorites obtained by electrolysing sea water. They would remember that the efficacy of the solution of that substance was found to lie almost entirely to the chlorine in various forms of combination, especially in relation to its combination with oxygen. They then made a small series of experiments with "chloride" (hypo-chlorite) of lime or bleaching powder, and came to the conclusion that here also they had to do with exactly the same thing. Happening to mention these experiments to Prof. Delépine he learnt that the Professor was carrying on a series of experiments with bleaching powder fluid, which naturally interested him very much, and he repeated certain of the experiments that the Professor had carried out. All that it was necessary to say there was that these experiments were carried out as Professor Delépine had described them, and that in every case exactly the same results were obtained. He mentioned that, because in carrying out experiments such as these two observers often came to very different conclusions; so that when two men, or three or four men, working independently, came to practically the same result, it must be acknowledged that the method was accurate, and that the results were probably reliable. Some time ago he had an opportunity of seeing the apparatus, the working of which Dr. Kenwood had described. From what one knew of its action in solution there could be no doubt that formic aldehyde or formalin was an exceedingly powerful disinfectant. As to the method of its application in the form of vapour, he was not yet satisfied. It might be said that this was because the experiments had not been carried out in exactly the same manner as they had been carried out by other workers; but in order to remove any objections on that ground the assistance of a gentleman had been accepted, who had full knowledge of the method of applying the process, and one who had a thorough knowledge of the whole question both from the practical and chemical points of view. This gentleman, who had an interest in the process, was good enough to apply it in his (Dr. Woodhead's) own room in the Laboratories on the Embankment. This room was placed absolutely at his disposal; the conditions under which the disinfectant was to be applied were controlled by him, and the organisms to be used selected by him. A certain number of organisms were taken on diphtheria swabs, and these were placed in various parts of the room. As he did not wish to trouble them with details he would reserve them for the printed paper.

Copy of Notes from Note-book.

Formaldehyde. 17/11/96.

2½ litres 40 °/₀ formaldehyde, 6 °/₀ calcium chloride. Driven into room through fine tube at pressure of 2½ to 3 atmospheres, for one hour. Then left for four hours. Vapour very irritating, and caused much coughing and weeping. Materials used scattered over room in the following positions, mantelshelf, waste-paper basket, chair, floor, table, and work table.

Substances used: Staphylococcus Pyogenes aureus from dip. case 798; dip. bacilli from cases 803, 818, and 819; short dip. bacilli from case 811; Staphylococcus culture from stock; potato bacillus with spores from stock; dust on cotton wool; and samples of dust left in position and collected for the purpose of making cultivations. The swabs, where nothing to the contrary is stated, were simply placed on a bed of cotton wool, that could afterwards be burned. Some, however, were left in open test tubes, whilst others again were left in the test tube with a loose cotton wool plug in the mouth.

The following table gives the details of the experiments. The + sign denotes that the micro-organisms remained alive; the — sign, that there was no growth in the medium into which the swab or dust was introduced. Cultures made 18/11; examined 21/11.

Organisms or Material Used.	Medium in or on which it was planted after it had been treated.	Position in which Material to be acted upon was placed.	Result.
Potato Bacillus Spores.	Broth	Hearthstone	Appeared later —
" " "	Agar	Table	+
Dust from window	Broth	Mantelpiece	—
" " "	Agar	"	—
Dust from floor	Broth	"	—
" " "	Agar	"	—
Dust left on top of cupboard	Broth	Top of Cupboard	—
" " "	Agar	"	—
Dust left on top of lintel of door	Broth	Top of Lintel of Door.	+
" " "	Agar	Fairly thick layer	+
Staph. in tube	Broth	Table	—
Staph. 98	"	Floor	+
"	Agar	"	—
"	"	Table	—
" in plugged tube.	"	Basket	+
Dip. Bac. 803	Broth	Table	+
"	Serum	"	+
"	Broth	"	—
" tube plugged	Serum	"	+
"	"	"	—
" short 811	Broth	Mantelpiece	—
"	Serum	"	—
"	"	Table	—
"	"	"	—
"	Broth	"	—
"	"	"	—
"	Agar	"	—
" tube plugged	Serum	"	+
" 818	Broth	Basket	+
"	Serum	"	+
"	"	"	+
"	Broth	"	—
" tube plugged	Serum	"	+
" 819	"	Table	+
"	Broth	"	+
" in tube	"	"	+
"	Serum	"	+
" tube plugged	"	"	+

These experiments could scarcely be looked upon as giving completely satisfactory results. It appeared that formalin vapour had very little power of penetrating to the deeper layers of the dust that was left in position in the room. Although thin layers as removed by the swabs were sterilised, most of that left in position still contained numerous micro-organisms. This was after the action of the aldehyde had been going on for six hours, which, he took it, was a very long time. Some of the swabs had never dried, that was to say they had been prepared a little time before they were to be used. Others were used moist. Some of these swabs were undoubtedly rendered sterile, but a very considerable proportion of them at the end of the process had on them micro-organisms that were still capable of development in a very short time. He mentioned this because they had used diphtheria bacillus, which was comparatively easily killed, but in some of the swabs remained alive, although it was killed in others. The staphylococcus pyogenes aureus and, of course, the potato bacillus were much more resistant. In at least half of the *aureus* swabs the organisms remained capable of developing when placed in broth. The potato bacillus remained active. This result, however, they expected, because they did not anticipate that any disinfectant of that kind could be sufficiently powerful to kill such resistant spores as those of this organism; and it was no serious accusation to bring against any method that spores were not killed by it, unless it was one in which the disinfectant was brought into direct contact by means of throwing the substance into solution. Very few substances in the form of vapour would kill spores. A series of experiments with the tubercule bacillus had been made, but owing to the faulty conditions of the experiment no reliance could be placed on them. All he could say at present was that he certainly looked upon Prof. Delépine's method of using bleaching powder in the ratio of one per cent. as being infinitely superior to any other method at present at their command. First of all, as the Professor had pointed out, it was perhaps a little difficult to use, especially if the room was not well ventilated. The great disadvantage of formic aldehyde was that the vapours were exceedingly irritating. During the time that the experiments were being made, the effect was so marked that the operator had to retire pretty frequently, and, they who were not actually assisting, had to keep a considerable distance away, even after the room had been aired for some time. This he looked upon as a very great disadvantage indeed, because unless they could light their lamp and leave it in the room for some time, they would find it would be very difficult to induce disinfectors to have very much to do with formic aldehyde. He should say that as yet, whatever it might become, the formic aldehyde method had not been proved to be as efficient as chloride of lime solution. Its possibilities were very great because of the very great activity [illegible] this material in solution, but for the present—so far as he had been able to learn—he thought they must agree that its use as a vapour had scarcely come within the range of practical politics.

NOTE.—Since I made these remarks I have had brought under my notice several methods of applying formalin vapour, by which some of the objections mentioned above are removed or minimised. I shall take an early opportunity of repeating some of the above experiments.—G. S. W.

Dr. S. **Rideal** (London) said that he must differ from Dr. Cameron in his opinion that it was difficult to analyse preparations containing carbolic acid, as—although it took a little longer to ascertain the amount of carbolic acid in one of its preparations—he did not think a chemist had any difficulty in determining the percentage of pure acid in such preparations. Dr. Cameron seemed to regard creosylic acid and carbolic acid as of nearly the same value; creosylic acid being slightly weaker than carbolic, in his opinion. Creosylic acid had a much higher value than carbolic, and that was a point to remember in dealing with these preparations. When a preparation was valued on account of the pure acid it contained, the pure creosylic acid had a much greater efficiency than carbolic acid. It seemed to be a fact that these acids acted in a different way according to the material with which they were associated. Trade preparations, emulsions with soap and gelatine, and so on, had certainly a higher value than the same amount of acid of the same strength acting alone, so that the presence of the soap, etc., conferred an increased activity to the solution. Therefore, though Dr. Cameron imagined that by buying crude carbolic acid he got a very cheap article, he was mistaken, as he did not get the same efficiency out of carbolic acid as he would if it were made into what they might call a trade preparation. Dr. Cameron himself could easily manufacture an imitation of one of these trade preparations by adding some soap to the acid and forming it into an emulsion, and in that way would get a disinfectant of far greater efficiency. Other speakers had made a comparison between chlorine and formic aldehyde. Chlorine had a molecular density of 35·5, aldehyde of 15, and phenol of 47. The rates of diffusion were inversely as the square root of their densities, so that, of the three, formic aldehyde had the greatest power of diffusion. It was much higher than chlorine, and chlorine had a higher rate of diffusion than phenol. Theoretically, therefore, one saw at once that formic aldehyde would penetrate much better than chlorine. They were, of course, talking about vapours, and what he said was that the vapour of formic aldehyde would diffuse better than chlorine gas or phenol vapour; and, in fact, of all the substances they had in use for disinfection, formic aldehyde vapour had the least density, and therefore the greatest diffusibility. If, further, as the density of air was 14·4 and that of formic aldehyde was 15, their respective rates of diffusibility were as the square root of 14·4 and the square root of 15, which were practically the same number. Therefore, formic aldehyde was diffusible into air at the same rate as air into formic aldehyde. Dr. Kenwood's experience supported this theoretical conclusion, and showed that formic aldehyde diffused more rapidly than sulphurous acid, and that it would readily diffuse right through a house as shown from its easy detection by its smell, and from passing away rapidly. There was another difference between chlorine and formic aldehyde which was also important for chemical consideration. The former was an oxidising agent, and the latter a reducing agent. Chlorine acted as an indirect oxidising agent by taking away the oxygen from the water with which it was associated.

Dr. Delépine thought that hypo-chlorite had an advantage over aldehyde because oxygen was necessary. The oxygen of the air was not necessary when they disinfected with hypo-chlorite because the water in the solution supplied the oxygen required. But there was a disadvantage from this very fact, and one which he thought was borne out by many of the experiments referred to. He believed the reason of the want of success was that the chlorine, although when brought into contact with the germ, killed it, the agent only killed the germ because it oxidised the organic matter in the germ; but, on the other hand, in presence of a large amount of organic matter the chlorine might expend itself upon such organic matter before it had time to sterilise the organisms present. The disadvantages attending the handling of chlorine were absent from bromine, and this latter agent had given good results in Germany some years ago. He objected, however, to both these bodies for disinfection because they were oxidising agents. Carbolic acid, though not so efficient an agent, was a good disinfectant in its way, because it was a permanent thing. It was interesting to note that both formic aldehyde and sulphurous acid were strong reducing agents, and were therefore opposite in character to chlorine and bromine. If there was a relation between the oxidising and reducing power of these compounds and their germicidal properties, then a formic aldehyde molecule and a molecule of chlorine or of bromine should all have the same action on organisms because they were chemically equivalent. He agreed entirely with what Dr. Kenwood had said with regard to the different lamps and to the different methods of application of formic aldehyde. He had tried this substance in the same room under different conditions as against sulphurous acid. With the latter he had obtained variable results, as in some cases when the room was made as dry as possible he had obtained better results than when he had sprayed steam into the room, and this was the converse of what one would have expected. Dr. Rideal then described at some length his experiments with formaldehyde, in which he confirmed Dr. Kenwood's experiments, and showed that with a great variety of organisms both the autoclave and paraform lamps gave satisfactory results. These experiments have been published in the November number of *Public Health*. In conclusion, he suggested that as they wanted to disinfect the walls as well as to ensure aerial disinfection, he thought they should first use a spray of formalin—though not of the strength recommended by Dr. Kenwood, 2·5 per cent. A solution of formalin containing ½ per cent. was quite strong enough, as 1 in 10,000 killed most organisms. After such spraying process a paraform lamp should be used, and he believed that this combination would be found the most satisfactory in general practice.

Dr. Childs (London) hoped that they might be allowed to hear an account of the experiments which Dr. Kenwood had himself made to show the action of formaldehyde vapour on living diphtheria cultures. Between laboratory experiments and the conclusions formed with regard to the practical exercise of their teaching there was a wide range of possibility for error. The study of the action of disinfectants on living micro-organisms,—the reputed causes of infection,—was full of difficulties, and often misleading. Not only did different species of bacteria, but even those of the same species, vary widely in their power of resisting disinfectants; so that it is not to be wondered at if different observers obtain very different results in observing the action of a given disinfectant on a given species of Bacterium. The experiments, of which he wished to hear an account had, he was sure, been conducted with the greatest care to prevent possible sources of error, and with a due amount of "control" experiments. They were of special interest in that they filled a gap between the laboratory experiments, made in test tubes, on slips of paper, etc., and the details of actual practice;—being made under conditions where the actual disinfection of a sick room infected with diphtheria was so far as possible imitated. They would like to hear also the conditions under which the similar experiments of Dr. Sims Woodhead were conducted, (the result of which differed from those of Dr. Kenwood), and especially to know the percentage of formalin vapour employed in each case.

Dr. LESLIE MACKENZIE (Leith) said it was not his disregard for Homer that made him give up fumigation by sulphur. It was simply because he had not the time for it. There appeared, however, from what some speakers had said to be a tendency to think too little of sulphur. Sulphur, as they knew from various investigations, was an efficacious disinfectant. What led him to give it up was the amount of time and trouble which would be required if the results were to be of any practical value. The proper carrying out of "fumigation" was very difficult, even in well constructed rooms, not to speak of broken-down cots where they could not keep the wind out, let alone keeping in the sulphur. He had been persuaded by reading Dr. Rideal's book on disinfectants to adopt "formalin" and to take the simplest method of using it by applying it in a solution to the walls of the house. He was glad to hear from Dr. Rideal that that was the simplest way; it was certainly the quickest and they could go over the ground with perfect accuracy. As to results, during the previous nine months 250 rooms had been sprayed in Leith with two per cent. "Formalin" and, so far from the spray being objected to, he had now applications for its use in even ordinary cases. People were glad to have it used instead of sulphur, which was such a nuisance. With the "Spray" he could now have four or five rooms and the furniture sprayed as well as the bedding removed, all in the course of four hours. As to the bacteriological experiments mentioned he was not competent to say one word for or against them. He was quite prepared to accept Dr. Kenwood's experiments, though with Dr. Woodhead's qualification, but until the bacteriologists were precise and agreed amongst themselves their method could not be adopted in practice. The Trillat method made it difficult to get over the ground, as did also Dr. Kenwood's. In the former the cost was 2s. 6d. per room, whereas they could at present disinfect at 2d. per room—and that was an important consideration, especially in small communities. He did not see why they should pay 2s. 6d. when they could get the same thing done for 2d. or 3d.

Dr. Charles Porter (Stockport) said that under the valued advice and guidance of Professor Delépine a one per cent. solution of chlorinated lime had been used in Stockport for the past three years with very satisfactory results, and it was refreshing to hear that general concensus of opinion as to the value of that disinfectant. It was supplied in pint bottles at double the pharmacopœal strength, and a slight amount of permanganate of potash was added to it to colour it, and prevent it from being taken internally by mistake. They found that it did not damage the wall papers more than ordinary washing, though it slightly discoloured some of them. One could tell at once from the characteristic smell, on going into a house, whether it had been used. Professor Delépine had referred to its irritating effect on the men employed as disinfectors, but he found in Stockport that they were able to use a one in a hundred solution of chlorinated lime without any distress or discomfort. When a room had to be disinfected the windows were opened and a fire was lighted, the object being to get rid of the infected air, and then the disinfector, under the supervision of the Inspector, washed the walls down with a long-handled whitewash brush, and where this could not reach they were "hosed" with a syringe, the results being very satisfactory. The people were got back into the house in a very few hours, so that it was unnecessary to provide shelter for those whose houses were undergoing disinfection. One objection occurred to him, and that was, that if the chlorinated lime solution used as a disinfectant got into the sewers and thence to the sewage works in any quantity, it would have a rather disastrous effect on the bacterial filters. The cost of the disinfectant was about 3d.–4d. per room, which was much less than anything claimed for formic aldehyde, and they had, in addition, Dr. Woodhead's eminent authority that the lime solution was the more reliable.

Dr. J. S. Cameron (Leeds) said his object had been rather to draw the gentlemen who had spoken than to communicate anything himself. To some extent he had succeeded, but he was looking for a sign, but no sign had been given him. He wanted to know, from the chemists, whether they could count upon either a reducing or an oxygenising property in the disinfectant, and if there was a ratio between such property and the disinfecting value. He wanted also to know the ratio of germicidal value of different disinfectants. When he spoke of sulphur, used in the old familiar way, he did not suggest that it was better than "Formalin" vapour, or that it was a disinfectant of the air. He did not want it to disinfect the air. Then came the question whether "Formalin" vapour could be adapted to use in a small space, so that they could disinfect anything like a book. They had books in the Free Library which needed some such treatment, but they could not be put into a steam or hot-air apparatus. They could, to some extent, hang them up by their backs and expose them to "Formalin." The difficulty would be to get the vapour to penetrate between the leaves. He was inclined to think, before hearing Dr. Kenwood's paper, that there might be some hope for them in that direction, but he was sorry to confess that his hopefulness in that direction had been not a little disappointed. One thing was quite clear from the discussion, and that was that a great deal remained to be achieved in regard to the use of "Formalin"—and other disinfectants. There was plenty of room for anybody, who cared to take the risk, to write a book on the subject. Dr. Rideal had written a book, but generally he rather told us what the manufacturers said about their articles than what he himself authoritatively thought. He was, perhaps, rather too modest to do that. The proper authority to undertake the work was surely the Local Government Board. He thought they might set one of their able Inspectors, who went about asking questions about loans for little hospitals, to do some useful work of this kind, which would be of service to scientific preventive medicine, and enormously help administrative Officers of Health.

Dr. H. KENWOOD (London) said the main conclusions in his paper were based upon a very large amount of authority, and his own experience only served to support the evidence of a considerable number of experienced bacteriologists of repute, who had experimented independently in England, France, Germany, Italy, and America. Though he had made every effort to collect the whole of the literature on Formic Aldehyde, as a disinfectant, the fact of Dr. Woodhead's experiment came as quite a revelation to him, and he regretted that it had not been previously published, as he was under the disadvantage of having heard only the most scanty information concerning the experiments and was therefore unable to weigh its value as against the many others which had been made. He had the greatest respect for any opinion expressed by Dr. Woodhead on the subject of bacteriology, and it was difficult to suggest how it was that so many others (referred to in the bibliographical note appended to the paper), were at issue with Dr. Woodhead—for practically every worker with Trillat's new apparatus had got results which warranted him in concluding that it was one of the most powerful means of room disinfection which had ever been employed. The power of penetration of formic aldehyde was a matter which could easily be demonstrated on a black-board from considerations of its physical properties, quite apart from the bacteriological grounds on which his conclusions were based. He was ready to concede that Dr. Woodhead's opinion on most subjects was more valuable than his own, but there was one matter in which he claimed to be a superior authority, and that was in regard to the question as to whether formic aldehyde was "within the range of practical politics" or not. He had had the advantage of directing and supervising these so-called "practical politics" for some six years in his capacity of Medical

Officer of Health, and he had recently worked a good deal with formic aldehyde, and he did not agree that its employment in actual practice was at all without the pale of practical politics. In the spray methods they had no guarantee that the man employed would do the work as thoroughly as is necessary, otherwise he would advocate the use of a spray of a weak solution of formic aldehyde, perchloride of mercury, or of the hypochlorite, as recommended by Prof. Delépine, but he thought the efficiency of any system of disinfection should not be dependent on the integrity of any employée. In answer to Dr. Childs he would like to say that the reason why he did not give the details of the experiments performed was because he thought that anyone specially interested in the paper could study them in the paper itself and they would take some time to read to the meeting. But he might say that growths from the same culture were exposed under precisely similar conditions, and for the same time, in a room which was disinfected and in another which was not, and in every case they satisfied themselves that whereas the growths were active and vigorous in the room which had not been disinfected, the cultures were destroyed in the room which had been disinfected. The object of the experiments was to see if formic aldehyde, when liberated according to the methods indicated in the paper, would be found efficient in our every-day practice of room-disinfection. Of those infections against which "fumigation" is employed in general practice, the specific organism had been identified only in the case of diphtheria, puerperal fever, and erysipelas, and the diphtheria bacilli were selected in the experiments because they were convenient organisms to work with, and it was not thought that there were any material grounds for believing that the streptococci of puerperal fever and erysipelas were any more resistant.

Mr. Wolf Defries (London) remarked that it was very satisfactory to him to learn that Prof. Delépine regarded the use of at least some slight pressure as indispensable in a steam disinfector. It was also interesting to learn that he had observed differences in the disinfectant action of such disinfectors according to the rate at which steam was produced. Prof. Delépine found the most favourable results from a very rapid current of steam, and obtained as he (the speaker) understood a reduction in the disinfectant value of the apparatus when the velocity was diminished. These data appeared to have been derived from experimental laboratory apparatus or models; and it would be extremely interesting to have some figures as to the actual velocities which corresponded to the full or the reduced disinfectant value of the apparatus. These figures were the more necessary, because it had to be remembered that the sectional area of a steam disinfector was very much larger in proportion to the sectional area of the steam piping than would probably be the case in the corresponding parts of a laboratory model. Accordingly in the laboratory experiments velocities would readily be obtained which in actual practice would be quite out of the question. In regard to Dr. Kenwood's paper the speaker did not think that the experiments described therein interfered with the balance of evidence that formic aldehyde had never yet been produced in a gaseous form capable for practical purposes of giving trustworthy disinfection. The experiments in question, so far as they had been disclosed, were open to one of the objections to which the speaker had drawn attention in his own paper, and on this ground must in any case be regarded as inconclusive; but supposing that the cultures which had been subjected to the action of the antiseptic gas had been observed for sufficiently long to warrant the conclusion that they had been disinfected, he must protest altogether against the adoption of the diphtheria bacillus as a standard for disinfection experiments. In any practical art the standard to which a process or apparatus was tested would be one of a severity at least equal to, if not slightly exceeding, the maximum which would occur in practice. It was not justifiable in so serious a matter as disinfection to deviate from this excellent custom; and in testing the disinfectant action of a process which might be called on to disinfect contagia such as those of small-pox and scarlet fever, of which the resistance was utterly unknown, it would be necessary before any satisfactory result could be obtained to use test organisms of at least a fairly high resistance, and not organisms, such as that of diphtheria, which were liable to "peg out" if one spoke crossly to them. The speaker had never suggested that any existing process for the disinfection of rooms was as satisfactory as was steam disinfection for every purpose to which it could be applied. The human error to which Dr. Kenwood had drawn attention unquestionably existed in regard to spray disinfection; but his own opinion was that this error was even more serious in the case of aërial disinfection, and he would think it more likely that an operator would fail to seal up some part of a room, so permitting the escape and dilution of the disinfectant atmosphere, than that he would in the double application of the spray omit to cover a contagious organism. An unprincipled workman could undoubtedly cause either the spray process or any process of aërial disinfection to fail, but on the one hand the speaker did not believe that the average person employed in disinfection processes was so utterly unprincipled as had been suggested, and on the other hand, if he were not, the speaker believed that it was easier for him to make sure that he covered the whole of the surface with a spray than to be certain of having achieved the far more difficult feat of entirely sealing up a room.

"*The Behaviour of the Diphtheria Bacillus outside the Human Body*," *by* Professor E. F. TREVELYAN, B.SC., M.D., M.R.C.P.

ABSTRACT.

THE Author first drew attention to the presence of the diphtheria bacillus in some cases of minor sore throat or unrecognised diphtheria, and also to the persistance of the bacillus in the fauces long after the attack of diphtheria was over, as in both of these cases disregard of well established facts might lead to the supposition that the infection was not conveyed directly from another person but was obtained from some other source, bacteriological examination alone enabled the observer to recognise the nature of such minor sore throats, as well as to fix, at any rate to a large extent, the time at which the individual convalescent from diphtheria was no longer a source of danger to others. After relating well known laboratory facts concerning the diphtheria bacillus, Dr. Trevelyan discussed in the light of recent published investigations, the occurrence of this micro-organism on clothes, in air, dust, water, sewage, articles of diet, especially milk, and in certain membranous inflammations in animals. The question of milk diphtheria was entered into in regard to (1) milk as a good cultivation medium for the diphtheria bacillus, and (2) the possibility of cows suffering from diphtheria and communicating the bacillus directly to the milk. The last supposition still required confirmation. Finally, the possible propagation of diphtheria through some of the domestic animals, and especially the cat, was discussed.

Dr. F. T. BOND (Gloucester) spoke of the difficulty of dealing with cases of what might be called mild sore throat. He referred to an outbreak which had occured in a village in his district, and said he examined the throats of the children attending the school and sent home half-a-dozen, whom he considered to be suffering. Amongst them a boy who had not exhibited any material evidence of diphtheria but whom he thought it desirable nevertheless to send home. Shortly afterwards the school closed for the summer holidays for five weeks, and during that time no fresh cases occurred. On the school being re-opened the children from the house, where the boy lived, returned to school, and three days afterwards they were attacked, and the boy himself succumbed. In regard to the other children the boy must have conveyed the infection to them; and he mentioned this as one of the most striking illustrations of the way in which the mischief might lie dormant for a considerable time, and that was just the very reason why the subject was one so difficult to deal with in elementary schools. He also mentioned an interesting case of the way in which diphtheria might be conveyed by second persons. The case was one in which a child was suffering from diphtheria, whose home was at

Newport (Mon.). The mother of this child, who died, came to a village in his district to stay for a few days with her brother who had three children. Within a week of her coming there one of these three children was attacked with diphtheria and died. The other two remained unaffected. He investigated the origin of the infection and he learnt that the child, that had been attacked, had on more than one occasion sat close to her aunt's knee with her head on her lap, while the latter was wearing at the time the dress which she had worn when nursing her own child. There were no other circumstances discoverable in explanation of the origin of the disease and the case was clearly one in which it had been conveyed to a third person by means of an infected article of clothing.

Dr. H. **Stott** (Medical Officer of Health for combined sanitary districts of East Sussex) said he was recently appointed to a district where diphtheria was prevalent. He was glad to hear Dr. Trevelyan's remark about the absolute importance of bacteriological examinations, because before they could draw conclusions it was exceedingly desirable that they should have full evidence. He alluded to the question of personal disinfection which was made because the person no doubt was the means of circulating the disease to a large extent. What he would suggest would be that there should be some form of spraying the throats of children attending elementary schools, where cases of diphtheria prevailed. There ought to be some form of disinfection or some means of spraying which could be used when the children came to school in the morning. The disinfecting of the schoolroom was a proceeding to some extent fallacious, because that did not affect the children's throats. He should like to know if bacteriologists had had their attention drawn to the condition of the soil in houses, especially in rural districts, where they found the rooms paved with flags or bricks with interstices between them filled with soil. He considered that it was an important matter for bacteriologists to consider as to whether the micro-organisms could reside in the damp and dirty floors found in the rural districts. He had tried to suggest to the local authorities that houses paved in this manner were dangerous to health and that some form of cement or concrete pavement with boarded floors above would be infinitely better. In investigating cases he had noticed the unsanitary condition of the houses, and remarked on the number of school children affected. He had also noticed that where children who had not suffered from diphtheria had returned to school within a month's time other cases would occur, showing as Dr. Trevelyan had said that, the microbe might reside in the throat for some time after the child was apparently better. It was important to observe these matters and try and find out the origin of the disease and means of prevention because local authorities were put to enormous expense in dealing with such outbreaks. A child who had only been partially disinfected might be the means of disseminating the poison for some length of time, and the only precaution was to thoroughly disinfect the throat before allowing the child to re-attend school.

Dr. LESLIE MACKENZIE (Leith) asked at what time milk, if inoculated warm with a small quantity of bacilli, was likely to become dangerous in practice. The question looked a little absurd, but it was a practical one, because he had asked the municipal authorities with regard to the milk on sale on counters to require that it should be covered up, and the answer was that the danger from any dust falling on it, so as to make it poisonous, was very little. A few years ago Professor Frankland pointed out that the *bacterium termo*, under conditions favourable to its dissemination, would in twenty-four hours increase to four millions. In Dr. Thorne's book impure water was not regarded as a good medium for the infection of diphtheria. But had not recent investigations made it necessary that more attention should be paid to that? Another question was as to the time that Dr. Trevelyan would regard as reasonable for the discharge from hospital of persons after the disappearance of diphtheria locally. Would he consider it to be safe after three or four examinations had given satisfactory results. This was important, because recently in Ireland an action was raised against a Medical Officer of Health in reference to a case of scarlet fever infected from a case discharged from hospital.

Dr. A. NEWSHOLME (Brighton) objected to the view that bacteriological observation should take the place of clinical observation as an entirely false view of the case, and he also objected to Dr. Trevelyan's remark that a large number of the cases of sore throat were not true cases of diphtheria because the Loeffler's bacillus was not found. He asked him—did he take the swab himself or did he know it was properly taken or if a germicidal application had not just before been made to the throat? He agreed as to the positive results, but the negative results must be discounted. He had no hostility to bacteriology. He had a laboratory himself and found it a valuable aid in diagnosis, but bacteriological observation would never supersede clinical work and never ought to do so.

Dr. WILLIAMS (Flint) mentioned a case for which it was impossible to account except by defective drainage. As to the case mentioned of a boy who had been sent home from school with a sore throat and afterwards had developed diphtheria at the end of five weeks, what right had they to say that he was not suffering from diphtheria at the time he was sent home. He would like to know from Dr. Trevelyan how soon immunity from the further attack on the part of the patient suffering from true diphtheria began, and he would like to endorse what the last speaker said as to conducting examinations and to know the percentage of results. In regard to the suggestion for the disinfection of the throats of all the children attending elementary schools he asked who was going to do it. Was it the Medical Officer of Health? If it was so he required to be better paid than he was now—for he was not paid for the work he did at present.

Alderman COMPSTON (Chairman of the Health Department of

Rawtenstall) said they had had diphtheria prevalent in their own borough in special districts. One outbreak was mainly confined to some new property, and its origin the Medical Officer of Health found difficult to trace. He spent some time investigating the infected locality and found eventually that the probable cause was misuse of the ashpits. In them were conditions which might breed diphtheria or something else, but unfortunately it was not necessarily those who had sinned that had suffered, the currents of foul air being conveyed to innocent people. Since the offenders had corrected their habits diphtheria had disappeared from that locality. In regard to disinfectants, some jocular remarks had been made as to the incompetency of the men employed to do the work of disinfection. He declared that it was a disgrace to Sanitary Authorities to employ incompetent men to carry out the process of disinfection: it was a technical piece of work which if not done thoroughly was useless. Why did they not employ a better class of men to do that which should be done with knowledge and skill?

The President of the Section (Mr. Pridgin Teale), said he made a few observations with diffidence. He was not a bacteriologist but had dealt with diphtheria as a definite disease. When he was a young man in family practice, a German book, translated and issued by the Sydenham Society, assisted in bringing a knowledge of the disease before English medical men. In those days cases of diphtheria were not numerous. They were mostly isolated and single instances, but they were so terrible that they made a great impression on medical men. When he was correcting the material for his book 'Dangers to Health' a case of diphtheria came up, and he endeavoured to ascertain whether there could be traced any connection between it and bad drains. Ordinary drainage defects did not appear to have any relation with diphtheria, and he then tried to ascertain if there was any other factor which might seem to be the cause and found that there was dampness. He made one picture in the book of what had occurred in two isolated farm-houses where a single case of diphtheria had occurred. They were totally isolated and a long way from any other house, and the medical man could not trace any connection with any other case; but it was found that outside each of the two houses there was a heap of manure, piled up against the wall making the walls damp. For one other case, the soil pipe passed through the house and being broken at the junction with the drain, deposited the contents of the w.c. in an uncovenanted cesspool under the house.

Prof. **Trevelyan** (Leeds), replying, said he was interested in hearing Dr. Bond's cases of minor sore throat. He would say in answer to Dr. Stott that it would be more satisfactory and easier to make a bacteriological examination than to disinfect a number of throats on the supposition that the disease might be there. After looking up the aspect of the subject thoroughly he had not been able to find any satisfactory evidence to show that the diphtheria bacillus was present in the soil. If the diphtheria bacillus had been inoculated into the warm milk and drunk by the patient it might incubate inside the body as well as outside. In regard to the discharge of patients from hospital, that was a difficult question. Supposing negative results had been obtained after several bacteriological examinations, that would warrant a limit of time being imposed. In some cases the bacillus remained only a short time after the attack while in other cases it might remain for weeks or even months. He was of opinion that a negative result obtained from the bacteriological examination of a single swab was of little value from a diagnostic point of view. As to the cases referred to, he had taken the swab himself, the patients coming to the Infirmary. They had no previous treatment, and as far as clinical examination went he thought the cases were diphtheria. As to the question of bacteriological and clinical investigation he did not deny that a characteristic case could be recognised clinically, but what he had said was that a typical case could not always be distinguished, and that there were cases where he defied anybody, except by mere guess work, to say whether diphtheria was present or not. As regards the diffusions of the diphtheria bacillus through the body, Kanthack's researches were as yet unconfirmed. In regard to drainage and diphtheria he would point out that while drainage was now more perfect than it used to be yet diphtheria was on the increase. When he came to Leeds eight or nine years ago it was an exceptional thing to see a case of diphtheria in the Infirmary, but now they saw cases fairly often; thus so far as Leeds was concerned the numbers would seem to be on the increase. The duration of the immunity against diphtheria was variable.

"*Some Sanitary Aspects of Advertisement*," by R. SYDNEY MARSDEN, M.D., D.SC., F.R.S.EDIN., &c. Medical Officer of Health for Birkenhead.

(MEMBER).

In the remarks which I propose to make on the subject giving the title to this paper, I fear I shall be considered by many to be entirely wandering from the class of subjects which ought to be dealt with in a Sanitary Congress.

I may however say at the outset that I conceive our duty to be a larger one than the mere consideration of what is involved in systems of drainage and water-supply, or a perpetual warfare against infectious disease, infantile mortality and the like, and that anything that acts deleteriously on the mental well-being of the community is a matter as distinctly calling for the attention of the Medical Officer of Health as if it had reference to the physical bodily health which is generally regarded as his sole province.

We want to take into our consideration a larger number of the great social problems which if left untouched, will militate against our best efforts at sanitary reform, and we have to do or should have to do, with everything that tends in any way to bring about unhealthiness either of mind or body; something is clearly amiss if regard for the health of the brain is not to be looked upon as requiring preventive treatment equally with any other ailment of the body.

Such then is the field of enquiry the gate of which I propose to enter, and I would ask your consideration for a few moments to the subject of a certain class of obnoxious advertisement with which alas! we are now all of us only too familiar, and which to my mind calls for drastic treatment and suppression at the hands of the Municipal and Sanitary Authorities of the districts in which these forms of advertisement are perpetrated, on the ground that they are directly detrimental to the moral health and well-being of Society.

I allude to that class of pictorial illustration of the worst forms of vice, violence, murder and torture, which are at present resorted to so largely by our theatrical companies for the purpose of appealing by excitement to the lowest component part of our natures, and evidently from its extensive use appeals strongly and effectively to a large section of the populace whose ill-developed natures are further deteriorated by the desire produced in them to see performed the blood-curdling acts so graphically depicted. To any well-conditioned mind these advertisements must be most disgusting, painful and objectionable; but my experience leads me to believe that they are a source of temptation and evil to certain ignorant and emotional classes of our people beyond what would easily or at first sight be believed. I here exhibit to you the sort of thing to which I refer. All these are the actual placards of well known and popular plays of the day, which are regularly distributed broadcast over our large towns for the purpose of "drawing" a house; and in these the class of artists who devise them seem to vie with each other to invent, for the benefit of the public and the lower orders of society, a suggestiveness for crime, which it would be difficult to imagine could well be excelled.

The general unhealthy influences of dirt, impure air, foul drinking water, over-crowding, and the rest are admitted by all to increase the virulence of epidemic diseases and the weakly conditions of the body. Are then the still more unhealthy influences to which I have referred as acting on the mind to be disregarded and allowed to work their own sweet will and effect on a class of people who from their ill-developed and weakly constituted brain power require the protection from it, of which at present they are entirely devoid?

I feel pretty certain that if we could trace cases to their first cause, many of the dreadful acts, which now stain our criminal annals, would be found to have primarily originated in the suggestions to action given by these degrading advertisements.

The history of medicine is full of examples of the influence of emotional conditions in causing and curing disease.

Dr. Clouston has laid down the principle the "brain cortex and especially the *mental* cortex, has such a position in the economy that it has to be reckoned with more or less as a factor for good or evil in all diseases of every organ; in all operations and in all injuries." "Life and mind are the two factors of that organic unity that constitute a real animal organism."

"The mental cortex of man is the apex of the evolutionary pyramid, whose base is composed of the swarming myriads of bacilli and other mono-cellular germs which we now see to be almost all-pervading in nature." "We talk and laugh and weep, we blush and shiver, we hunger and sweat, we digest, etc., etc., all through the brain cortex. Not one of these physiological acts but can be instantly arrested by a mental act. Every one of them may through morbid cortical action become excessive or diseased."

"The evidence that the brain cortex regulates absorption, secretion, vascular tone, and the anabolic and katabolic processes in the cells of the tissues, may now be regarded as complete. Sores in many melancholic persons will not heal. The gland and the lung tissue in idiots and dements are unable to resist the attacks of the tubercle bacilli; so that two-thirds of our idiots and one-third of our worst dements die of tuberculous affections."

The nervous and mental element in disease is a universal and constant one although it prevails in different cases to a different extent. It therefore calls for our constant watchfulness. This is a fact that I am most anxious to impress upon you, for it is of far more consequence that our profession should remember the common than the uncommon in dealing with some of the problems of preventive medicine.

How important it is then that we should keep the minds of the people free from unhealthy brain stimulants will I think be evident to all, and I would again contend that it is a fitting subject for our consideration here.

The control of preventable influences, such as these objectionable forms of advertisement, must be put under the sanitary authorities, who shall have power to prohibit their being placarded about their districts if they consider it necessary. And I think every properly balanced mind must regard such direct incentives to crime as distinctly unfit for publication on the walls of our great cities.

No phase of the subject of preventive medicine, it seems to me, is more important to the well being of the individual amongst the lower orders of Society, and therefore of the community at large, and I think our laws ought to provide us with a means whereby any individual might be prevented from endangering the health of his fellow men either through ignorance, thoughtlessness, cupidity or from any other cause whatsoever and from degrading our towns by these dangerous methods.

But the evil still goes on and at present we have no means of preventing it, whilst in the meantime the public disregard it; but the evils caused thereby are material and are in many ways undermining the morality and strength of the people.

We are inclined to ask with Dr. Acland "Does the moral state of our people keep pace with their greater physical advantages? Are we not in danger of forgetting in the midst of our boasted material and intellectual progress, that it is as certainly true now as ever it was, that the largest part of the misery among men depends, at least, on moral as much as on material causes?" These and many other such questions rise in the minds of Medical Officers of Health when they are met by many of the greatest problems of public health and Sanitary Science.

Dr. F. Vacher (Medical Officer of Health for Cheshire) said he did not consider that the author of the paper had wandered far from the point. The posters of which he complained must, undoubtedly, have a prejudicial effect upon weak minds, while there was also a further element of danger to which Dr. Marsden had not drawn attention. This was an age of collecting. They were all—themselves or their children—collectors, to some extent, of postage stamps, old prints, old examples of lace, &c., and recently there had sprung up a craze for collecting match-box labels. The extraordinary extent to which the practice had grown in Paris and some other continental cities might well astonish people. There were regular dealers in match-box labels; but he did not know until his last visit to London that one of the objects of certain collectors was the collection of extraordinary posters, which showed the dramas running in certain houses. These were collected just as stamps were collected. All this fashion showed that here was an evil which they should proceed against as far as they could. Not only were the offensive placards seen by the man in the street, but weak-minded or morbid people were encouraged by dealers to become collectors of them. He heartily supported Dr. Marsden.

Mr. **Mainwaring Holt** (Medical Officer of Health for Malton) said that carrying the question a little further they saw that whatever good might be done by municipal authorities in the way of producing or encouraging the production of good art for the elevation of the public taste, was practically neutralised by the bill-poster and his pictures upon the numerous hoardings. Moreover anyone might see for themselves slum children enacting the scenes which the posters represented; to them indeed such posters meant the whole play and nothing but the play. He had much pleasure in giving Dr. Marsden his warmest support. He did not object to posters of an ordinary type, but he drew the line at blood curdling and inartistic productions, and said that individuals received their knowledge through the general senses. The sense of sight was at once the quickest and most impressionable, and it was through this channel that the objectionable representations, in the shape of blood-curdling posters, appealed.

"*Report of the Royal Commission on Vaccination*," *by* FRANCIS T. BOND, M.D., B.A.LOND., F.R.S.EDIN. Honorary Secretary, Jenner Society.

THE Royal Commission on Vaccination having presented their Report to Parliament it is only natural to expect that legislation should ensue for the purpose of giving effect to their recommendations. In recognition of this expectation the Government have announced that they are preparing a Bill on the subject. It is, therefore, expedient that some effort should be made to collect and focus the opinion on this matter of those who are qualified by their practical experience and by their interest in the administration of vaccination itself, as well as in sanitary progress generally, to give useful advice in regard to it.

RECEPTION OF THE REPORT.

It cannot be denied that the Report of the Commission has not been received with unmitigated satisfaction by either party to the controversy which has for some years existed about vaccination. Its opponents, though perhaps not altogether surprised, are disconcerted at the cautiously expressed but unquestionable confirmation which the large majority of the Commissioners have given to the views which have for many years been entertained respecting vaccination by the medical profession, with the most trifling exceptions, in all parts of the world. They conceal their annoyance on this point by proclaiming with great jubilation the concessions to obstinate recalcitrants which the Commissioners have unanimously recommended. The advocates of vaccination, on the other hand, have in some cases expressed their dissatisfaction with the measured terms in which the Commissioners have generally delivered themselves when dealing with some of the questions around which dispute has especially raged. They seem to have forgotten the difficult position in which the majority of the Commissioners were placed by the existence in their body of a small but keenly critical minority who showed themselves, from first to last, only too ready to profit by any advantage that was afforded them. They are also annoyed at what they consider the undesirable concessions by which they think that the safety of the community will without adequate reason be imperilled.

Between these conflicting views it will be the duty of the Government to steer, and in so doing they will naturally look for light and leading from that portion of the public who are entitled by their intelligence and their appreciation of what is practically expedient, no less than of what is abstractly desirable, to give them material help.

In dealing with the subjects of the Commissioners' report which involve legislation, it is only possible to consider here, in view of limitations both of time and space, those which affect the cardinal aspect of the question, the enforcement of vaccination. There is the less need for regretting this limitation, as legal compulsion is the only section of the subject about which any serious contention prevails. There may be differences of opinion about some of the other sections, but they are not such as are likely to greatly disturb the general unanimity of the supporters of vaccination, or as cannot be settled by the careful consideration of those who are experienced in these matters.

RECOMMENDATIONS OF THE COMMISSIONERS.

The two questions on which alone the Commissioners have arrived at a unanimous conclusion are as to the undesirability of inflicting repeated penalties on vaccination defaulters, and of attempting to enforce vaccination by any penalty in cases in which parents are obstinately opposed to its adoption. As to their reasons for the latter of these recommendations the Commissioners are not unanimous. The majority of eleven found their recommendations on consideration of the impossibility of enforcing the vaccination of an infant in any case in which the parent positively objects, of the inexpediency of making the attempt to enforce it on "honest" objectors, and on the prejudicial effect which the attempt to do so will exercise on vaccination itself. They distinctly indicate that their object ng these recommendations is to promote vaccination, and xpress the hope that the effect of their report "will ate belief in the efficacy of vaccination, that it will re- some misapprehensions, and reassure some who take an gerated view of the risks connected with the operation, as as lead to a more ready enforcement of the law by local orities."

WHO SHALL BE EXEMPTED?

It is unnecessary to discuss the propriety of the first of these commendations. If it be not desirable to attempt to enforce accination under any circumstances in the teeth of determined pposition, it is obviously not expedient to do so by repeated penalties. The only questions which remain are, "How far is it expedient to attempt to enforce vaccination at all?" and, "If the attempt is to be limited, to what extent shall it be so?" The Commissioners suggest that any one who objects to have his child vaccinated should be exempted from the operation of the law by attending before the local authority, and making a statement to that effect or by making a statutory declaration before some authorised official. But it is difficult to see what is gained by such a course which would not be better obtained by requiring the objector to make his objection before the magistrates. They are the persons appointed by law at present to consider and deal with objections, and there seems no sufficient reason why the law in this respect should be disturbed.

THE MAGISTRATES' DISCRETION.

A more important question arises as to the way in which objectors are to be dealt with. At present the magistrates have a large discretion in dealing with objectors. They may dismiss a case if they consider that the defaulter has reasonable grounds for his objection, or they may suspend vaccination for certain reasons, or they may fine the objector in any sum not exceeding twenty shillings. If they had exercised this discretion more largely than they have generally done much of the opposition to vaccination which has been created would never have arisen. Even now, without any modification of the law, they can do much to prevent the extension of the agitation, but it would be unquestionably desirable that their powers in this respect should be made clearer than they are, and, where necessary, extended.

But if the magistrates are to exercise a discretion, on wha basis are they to do so? The Commissioners are very distin heir opinion that only "honest" objectors should be excus and that any concession to this class should not be extended to the "indifferent and the indolent" parent, whose objection is not to vaccination but to the trouble of taking his child to be vaccinated. They propose to remove all pretence for objection from this class of defaulters by sending the public vaccinator to their doors as is done in Scotland. It may be assumed, therefore, that only those objectors whose opposition to vaccination is very decided will present themselves before the magistrate. And here it may be remarked that it does not seem either fair or necessary to summon a man who is willing to attend voluntarily before the Court in order to state that he has an objection to vaccination. There is no reason why he should be made a defaulter and treated in some respects as if he were a criminal, if he will come voluntarily and ask for consideration of his objection. It seems evident, therefore, that in any amendment of the law a distinction should be made between those objectors who are prepared to state their objection without being summoned, and those who refuse or neglect to do so and who become thereby defaulters.

But, assuming that a parent appears before the magistrates and states that he objects to the vaccination of his child, how is his objection to be dealt with? If the recommendation of the Commissioners is to be carried out, and it is difficult to see how it can be ignored or evaded, every objection thus formally made must be admitted, and exemption granted to the person who makes it. And for these simple reasons, that the vaccination of the child cannot be certainly enforced by refusing exemption; that it is not practicable to distinguish between "honest" objectors and those who are not honest, and that it is not expedient that the State should enter into a contest with an objector, which, if unsuccessful, brings the law into discredit without benefiting the community. There are, however, two points connected with this stage of procedure which require consideration. The first refers to the extent of the relief to be granted. The second, to the way in which objections shall be dealt with.

SUSPENSION OF VACCINATION.

So far as can be judged from the somewhat vague form in which the Commissioners have presented their suggestions it might be assumed that the exemption of an infant from vaccination once granted would be perpetual. There are good reasons why this should not be so. One is that the objection of the parent, however strong at first, may in time disappear. Another reason is that the State is really the ultimate guardian of the child, and however expedient it may be to defer to the parent's objection to have his child vaccinated in infancy, it would be a dangerous precedent for the State to entirely abrogate its right to protect the child against small-pox should occasion arise for doing so. For, in the words of the Commissioners, "it is better for the child and better for the community that it should be vaccinated than that it should remain unvaccinated." It is expedient, therefore, that any exemption of an infant from vaccination conceded on the ground of objection by the parent, should be in the form of an order for suspension only. The period for which the order should be operative is naturally that which intervenes between infancy and the age when the child enters upon school life. At this stage of its existence it has not only passed beyond the influence of the conditions which complicate infant vaccination, but it is more exposed to the risk of infection from small-pox than it was at an earlier age, from the fact of its coming so much more into relations with the community generally. It is desirable, therefore, that the objecting parent, if still alive, should have an opportunity of reconsidering his objection, and that if he still object to have the child vaccinated he should be required to obtain a renewal of the order for exemption.

CONDITIONS OF SUSPENSION.

But there is another matter which requires to be considered at this stage and that is the conditions under which the order for exemption should be granted. Admitting, as seems unavoidable, that every objection which is formally made in a Court of Petty Sessions should be met by an order for suspending vaccination, it does not necessarily follow that the order should in all cases be granted on the same terms. Some discrimination is both justifiable and desirable here. There are unquestionably cases in which, from circumstances connected with the family history of the objector, or within his personal knowledge, objection may be fairly allowed to be covered by the word "reasonable" which the law at present recognizes as sufficient to justify the cancelling of an order for vaccination that may have been made by a magistrate. In such cases it is certainly also reasonable that the order should be granted without any cost to the applicant beyond what may be involved in a small charge for registration. How far the term "reasonable" could be stretched to cover objections which though not justifiable as such by an examination of the evidenc by which they are supported, might yet be reasonably admitte as a matter of expediency, is a question more, perhaps, casuistry than of practical administration. It may be suggested that whilst there might be difficulty in giving such a wide interpretation to the word "reasonable," it would be removed if for "reasonable" the word "sufficient" were employed. An objection might be sufficient, in the sense indicated by the opinion of the Royal Commissioners, although it could only be held to be reasonable by an undue stretching of the meaning of that term. What is important also to note is that whilst the objection would be sufficient to justify the suspension of the child's vaccination, it might be of such a nature as to be urged for reasons that were obviously unreasonable or frivolous. To meet such cases, and also to preserve a proper distinction between these two classes of objectors, it is desirable that the power which the magistrates at present possess of imposing Court costs, and a penalty not exceeding twenty shillings, should be retained. If all objectors, whether their objections be reasonable or not, are allowed to claim an order of exemption without any penalty or charge beyond a nominal one for registration, it will be a practical admission that the vaccination law itself is unjustifiable, or that it is of no importance whether a parent's objection to it be serious or not so long as he makes one of some kind.

NEED FOR INQUIRY.

But there is another important reason for discriminating between objections, and that is, that where the objection is founded on the allegation of injury having resulted from vaccination in some member of the objector's own family, or in circumstances within his personal knowledge, it is in the interest of vaccination itself that the objection should be enquired into, if it be practicable to do so. No small portion of the prejudice which has been excited against vaccination has been created by the belief, whether reasonable or not, in the reality of such mischief. Had even a moderate percentage of the cases in which mischief has been thus alleged to have happened been authoritatively inquired into and the result published in the locality in which they occurred, it is not too much to say that the prejudice against vaccination would have been far less than it is at present. The supporters of vaccination have assumed in this, as in other matters, that because the propositions of the opponents of the practice appeared to them unreasonable their statements are not worth investigating or exposing. This has been a deplorable error, and we are now paying for the consequences of it, as of other errors in this matter, by the creation, amongst the less informed classes of the community, of a prejudice against vaccination, which it will take time and trouble to eradicate, and would not have arisen had a different policy been adopted.

It is not, of course, to be expected that the Justices on whom the law imposes the duty of administering the vaccination law could themselves undertake to inquire into statements, the investigation of which would require special knowledge, possessed only by a trained expert. But this difficulty might be met by enabling them to call in the services of such an expert to inquire and report to them on the subject when necessary, of any statement as to injury having arisen from vaccination in any case pertinent to that under consideration, and one which conditions of time and place rendered susceptible of investigation by the resources at their disposal. Such an expert is to be now found in every petty sessional area, or at any rate in every county or other large sanitary district, in the person of the Medical Officer of Health, whose general duties qualify him for such inquiries, and the report of whom might be regarded as authoritative. Upon a consideration of his report and on the general nature of the objection raised by an objector the Court would be in a position to judge how far the objection was reasonable or not, and what penalty or costs should be imposed upon the objector.

ADVANTAGES OF SUSPENSION.

There are several distinct advantages to be gained by suspending the vaccination of the infant. In the first place, the right of the State to the guardianship of the child would not be formally abrogated as it would be if the child were exempted from the operation of the law without any condition. In the second, by suspending the child's vaccination until the school age one very serious source of objection, that of the mother, would probably be eliminated. Her objection is a very intelligible one; but the older the child gets the less serious does it become. Moreover, the dangers of complicating vaccination with the troubles of infancy, which are the source now of so much of the misconception and misrepresentation by which the agitation against it is supported, would be avoided. With the view of in some degree lessening these dangers the Commissioners have suggested that even in the absence of objection, the vaccination age should be extended from three to six months after birth, as in Scotland; and there are good grounds for suggesting that the time might be extended to at least the end of one year, if not to nearly two years after birth, as is the case in Germany. The risk of the child's catching small-pox within that period would not, under ordinary circumstances, be a serious one, and it would be largely compensated by the elimination of dangers of a more imminent kind.

WHY SUSPEND UNTIL THE SCHOOL AGE?

But it may be said, why suspend vaccination until the school age? To this question there are again several answers. The most obvious is that it is the first stage in the career of the child after its birth at which the vaccination authority can certainly come again into relations with it. At birth the necessity of registering the birth enables the parent to be served with a notice requiring him to have the child vaccinated. But if the child's vaccination is then suspended the vaccination authority will lose touch with it until it comes under the cognisance of the school attendance officer. The child is then for the most part, to be found in school, and it will be easy for the authority to satisfy itself as to its vaccinal condition. All that is necessary is that an authorised medical man shall be required to make periodical inspections of schools, whether public or private, for this purpose, and that the parents of those children who do not present evidence of effectual vaccination shall be informed that these children must be vaccinated unless a fresh order for suspension is obtained. By the time this action would have to be taken circumstances might have rendered it a mere formality. The objecting parent might have died, or his objection might have become so far modified that he would not care to press it and thus advertise his child as unprotected in the face of the rest of the school. If he still preserved his scruples he would be able to obtain a further order for exemption on the same terms as those on which it was originally granted to him in infancy. He would certainly have no just ground for complaint or claim to sympathy if his child were vaccinated in the absence of any order which he might thus so easily obtain.

Another reason for reviving the liability to vaccination on the child arriving at the school age has been already alluded to in the fact that it then comes into much closer relations with the community generally, and is consequently much more exposed to the risk of infection than it was previously. The facility with which unvaccinated children may receive and spread infection in school was well illustrated in the Gloucester epidemic.

RE-VACCINATION IN CONNECTION WITH SCHOOL LIFE.

But perhaps the most important advantage of identifying vaccination with school life is not only that it may secure the vaccination of the child if it have not been effectually vaccinated previously, but because before the child leaves school it will be expedient to re-vaccinate it. It is this recognition of vaccination as an essential element of school life that offers the key to the solution of the most serious complications of the vaccination problem in this country, for it removes the difficulties, which are otherwise insuperable, in the way of maintaining not only an efficient system of primary vaccination but also of effecting, what is quite as essential, if we are to avoid the epidemics of small-pox which have become increasingly frequent of late years, the establishment of re-vaccination on an equally solid foundation.

RE-VACCINATION AN ESSENTIAL ELEMENT OF A NATIONAL SYSTEM.

Our existing system of Vaccination, which only protects children and exposes the adolescent and adult, in whom the protection conferred upon them in infancy has been gradually weakened, to the risk of catching small-pox, even though it may be only in a modified form, is so imperfect that it has but small claim to be called a national one. Jenner, and those who lived in the early part of the century, had good reason for cherishing the belief that a single vaccination protected for life. But Jenner himself was disillusioned on this point before his death, and the obligation which facts imposed upon him of recognising that the protective influence of even a typically good vaccination was not absolute and ineradicable was, no doubt, a severe blow to the enthusiastic hopes which he had honestly entertained and led others to cherish on the subject. There is, however, not only no room for misconception now on this point; there is every need for making re-vaccination a prominent feature of any system that has any claims to be considered a national one. The importance of so doing has been repeatedly insisted on by all the highest authorities on the subject. Unfortunately such advice must be regarded as purely academic in its character unless it can be shown how it is practicable to carry it into effect. A very little consideration will convince that in the case of those who have passed beyond the school age it is not possible to establish anything like a system of general re-vaccination such as that which we can maintain in the case of primary vaccination. We may, it is true, secure, as we do at present, through the influence of the State as the great employer of labour, the re-vaccination of important sections of the community, such as the Army, Navy, Police, and Postal Services; but, after all, these classes represent numerically but a small portion of the whole adult population, and mainly include the male sex only. Something might, no doubt, be done to impress upon private employers the importance of making re-vaccination a condition of service; but in the face of the increasing difficulties of the labour question, it is to be feared that any advice which the State might tender in this direction would be looked on rather as a counsel of perfection than as an embodiment of actual duty.

Under these circumstances, therefore, the adoption of re-vaccination as an incident of school life and the logical complement of vaccination under the same conditions, presents itself as the only solution of the vaccination problem in regard to re-vaccination, which is simple, practicable, and effective. That it is so is proved by the experience of Germany. And although the label "Made in Germany" is not one that commends itself in ordinary commercial transactions, the success which has attended the German vaccination system is such as to show that it is the outcome of a well-considered and practicable scheme. Nor has this scheme been forced upon the country, as is sometimes represented, by a bureaucratic government; it has been adopted by the National Parliament as the result of the lesson taught to the whole of Germany by the experience of the epidemic of small-pox in 1870-2.

It was this experience, and more especially that of the large number of cases of small-pox which occurred amongst once vaccinated adults in Bavaria and also that of Frankfort in escaping epidemic small-pox when flooded with French prisoners suffering from it during the Franco-German war, owing to the general vaccination and re-vaccination of its citizens, which opened the eyes of Germany to the necessity of making re-vaccination a feature of her national system of protection. It is to be hoped that the result of the similar experience of Gloucester during its recent great epidemic may teach a similar lesson to the people and Parliament of Great Britain. Should it do so, the citizens of Gloucester will have some compensation for the price which they have had to pay for buying this experience.

It is not to be supposed that the proposal to graft vaccination and re-vaccination on to our national system of education will not meet with a certain amount of opposition. Those who object to vaccination under any conditions will, of course, oppose it energetically. Even the zealous educationalist, who may have no antipathy to vaccination itself, will possibly, in some cases, resent the introduction into the curriculum of school life of what he may consider another disturbing element. But it may fairly be assumed that the great mass of intelligent persons, when they can be made to see, as the German nation has done, that there is really no practicable alternative between this course and the abandonment of anything like a national system of protection against so dreaded a disease as small-pox, will acquiesce in the necessity for adopting it.

It is well also to bear in mind in connection with the re-vaccination of children in public elementary schools, that a child of about twelve years of age is in a state of transition, physically, intellectually and socially. It is not only in some respects putting on a new physique, but it is about to pass from the influence and control of its parents to a stage of its life when it will be in a large degree its own master, and when it will not be so amenable to advice on matters that are somewhat out of its grasp as it is before it leaves school.

If at the time when the end of its school life was approaching it were to receive some information, in the shape of readable literature, showing the history of small-pox and vaccination and the reason why the adoption of the latter is expedient for the general good, it is very probable, not only that any feeling of repugnance to the operation, if such should by any means have been previously excited in the child's mind, would be allayed, but that the child itself might, as the result of intelligent conviction, become a useful aid in strengthening, both at the time and in after years, the convictions of others.

We have, in this way, at our hand, an invaluable opportunity for influencing the rising generation, and it will be extremely foolish if we throw it away. Even where, through parental prejudice, the child may have escaped vaccination in early life, it might probably at this stage be brought within the fold of protection.

Whether this course be adopted or not, it is eminently desirable that more effort should be made than has been hitherto done, both by the Government and by associated enterprise, to diffuse information as to the evidence in favour of vaccination. If it be thought to be the duty of the State to advise, much more to enforce a practice which is particularly open to misrepresentation, as vaccination unquestionably is, it is surely also a duty to spare no effort to protect the public against the misconceptions to which they are thus exposed. Why, for instance, should not every parent who receives a notice of the requirements of the law in regard to the vaccination of his child be furnished at the same time with an intelligible statement of the reasons why the law imposes this obligation upon him?

There are other subjects of importance connected with the Report of the Royal Commission and with the legislation, which must follow on it, which invite discussion, such as the questions, to what authority is the administration of vaccination to be in future entrusted? Is it expedient that every medical practitioner shall be recognised as a public vaccinator? How can the certificates of vaccination and of deaths from small-pox be improved so as to make them more trustworthy records than they are at present? And how are sanitary authorities to be induced to make adequate provision for isolating small-pox and other infectious diseases, as the Commissioners advise? These questions, though of much importance in connection with the re-organisation of vaccination administration, are, however, subordinate to the fundamental problem which has been discussed here; they involve technical considerations which cannot be adequately dealt with in this place; and they are much less open to contention than the question, whether an efficient national system of vaccination is to be maintained or not? What such a system can do, when it is effectually established and maintained, can be learned by studying its effects during the last twenty years in Germany, where we have an object lesson as unimpeachable and convincing of the results to be expected from carrying the vaccination of a nation out thoroughly as the experience of Gloucester has afforded of those of its local neglect.

Finally, it is necessary to refer to one other aspect of this question, which is no less important than the others that have been dealt with. That genuine grievances exist in connection with vaccination procedure at present it is impossible to deny. It is more than a grievance, it is a scandal, that the law does not press equally upon the poor and upon the rich. The rich dissentient can contract himself out of vaccination by the payment of a fine which to the poor man may mean the breaking up of his household or imprisonment. The rich dissentient need not even appear personally in court; he can fee a lawyer to attend on his behalf. The poor man must either go himself or send his wife, or run the risk of being dealt with as contumacious. The rich mother can have her child vaccinated at home, the poor one has to take hers to a public station, often at a distance of some miles, and through rain or snow. The rich mother can persuade a complaisant doctor to vaccinate her child with only one mark, and to certify, as he legally can do, that it has been "successfully" vaccinated. The poor man's child has to be vaccinated in four places, for which he is not thankful, as he ought to be, and which the mother resents as a grievance, as it truly is, if all children are equal before the law. If there is one thing more than another that is indispensable in any new legislation on this subject, it is that all citizens, rich and poor alike, shall be treated with absolute impartiality. We cannot afford to have the benefits of vaccination whittled away by the exasperating effect of unjust social distinctions. In the words of the Commissioners, "No consideration of cost ought to be allowed to stand in the way of any improvement which would render the operation less burdensome or diminish its risk. It is only fair to demand this, if vaccination is to remain compulsory."

SUMMARY.

It may be well to summarize briefly the propositions which it has been sought in the foregoing considerations to establish, as well as the stages of the procedure by which it is suggested that they should be realized.

The propositions are:—

1. That it is expedient to give effect to the unanimous recommendations of the Royal Commission on Vaccination, that repeated penalties for default in the vaccination of infants should no longer be enforced, and that parents who persistently object to the vaccination of their children should not be fined for non-compliance with the law when sufficient grounds for exempting them from it exist.

2. That the object of the Commissioners can be attained with least risk to the community, with least disturbance of the present law, and with reasonable consideration to those who are amenable to it, by the magistrates exercising more largely than they have hitherto done the discretion with regard to the enforcement of vaccination which the law already gives them; by an extension of that discretion, so far as may be necessary, and of the principle of temporary suspension of vaccination, which is already recognized by the law, in cases where it may appear expedient; and also by providing for the distinction between *defaulters* through negligence or indifference and *objectors* who urge sufficient grounds for their objection, by giving the latter an opportunity of applying voluntarily to a court of summary jurisdiction for an order for the suspension of the vaccination of their children instead of their being required to be summoned as at present.

3. That it is expedient in justice to objectors no less than in the interests of the community generally, that in any case, in which objection to the vaccination of a child is made on the ground that injury from vaccination has been experienced in the family of the objector or that there is special reason for fearing danger therefrom to the child, competent inquiry should be made into such allegations, and a report thereon presented to the Justices for their information as well as for that of the public.

4. That it is desirable that the recommendation of the Royal

Commission as to the extension of the vaccination age of infants should be accepted, with the view of obviating disadvantages to which the vaccination of young infants is exposed, and that the age might be extended even to twelve months without serious risk, and with advantages which would do much to compensate for such risk.

5. That it is expedient, in order to diminish as much as possible the danger to the community of a number of unvaccinated children growing up in it under such an arrangement as the foregoing, that the vaccination of a child should not be suspended for a longer period than four years from its birth; that at the end of that period or upon its being received into any school or other place for its education or maintenance, its liability to vaccination should revive, and that further exemption from such liability should only be obtained by a further order for suspension, as in infancy.

6. That it is expedient in view of the fact that outbreaks of small-pox so frequently occur amongst those who have been vaccinated in infancy, but have not renewed their protection in after years, and of the evidence contained in the Report of the Royal Commission as to the protection, which re-vaccination confers, and as to the desirability of such renewal at the end of childhood, that re-vaccination should be systematically required of all children at public elementary or other schools about the age of twelve years, in the same way as primary vaccination would be in early childhood, under the conditions suggested above.

7. That it is expedient that there should be more effort than has been hitherto made, both by official and other means, to inform the public as to the evidence on which the belief as to the efficacy of vaccination as a preventative of small-pox rests; to inquire locally into allegations of mischief produced by vaccination, and to expose in every practicable way the misconceptions and fallacies by which the confidence of the public in vaccination has been shaken.

8. That it is only just that in all matters connected with vaccination procedure there should be as little distinction as possible between rich and poor.

The order of procedure involved would be as follows:—

(*a*) The parents of all infants would be required to have them vaccinated, and would be formally notified to that effect, as at present, but the period within which this would be required to be done should be extended to twelve months, or even as in Germany, to the first calendar year after that in which the child had been born, except in case of the prevalence of small-pox in the neighbourhood of the child's residence.

(*b*) Any parent who might wish to be relieved from this requirement should be at liberty to make an application to that effect to a court of Petty Sessions, at some time before the expiration of the statutory period, accompanied by a formal statement of the grounds of his objection, and should be granted an order suspending the vaccination of the child until four years of age, on payment of a small registration fee and with or without payment of costs, at the discretion of the Court, regard being had to the nature of the objection alleged, and subject to the right of the Vaccinating Authority to make an application at any time for the supercession of the order on showing cause for so doing.

(*c*) If any parent made default in having his child vaccinated within the statutory period, without having obtained a medical certificate of unfitness, or an order of suspension, he would be summoned. After hearing any grounds of objection which he might allege for being relieved for the time from compliance with the law, an order for suspending the vaccination of the child would be made, subject, as before, to the right of the Vaccinating Authority to apply at any subsequent date for an order to vaccinate, on showing cause for so doing. The defendant in this case to be liable to pay a penalty as well as court costs and the registration fee.

(*d*) In case of failure to appear, the magistrates would make an order for vaccination, the disregard of which would be followed by the same consequences as at present.

(*e*) On joining a school, whether public or private, or on attaining the age of four years, a child would become liable to be inspected by the appointed official, and, if not found to be efficiently vaccinated, the parent would receive notice that the child must be vaccinated unless a medical certificate of unfitness or an order for suspension were obtained by him. Such order to be obtained in the same way as in the case of infant vaccination.

(*f*) Every child attending a school, whether public or private, or on attaining the age of ten years, to be liable to be re-vaccinated, or to be vaccinated, as the case may be, subject to exemption under the conditions prescribed previously.

(*g*) The Medical Officer of Health to act as general referee in all questions connected with vaccination, and to be empowered to visit all schools or other places for the maintenance and education of children, for the purpose of inquiring into their condition in regard to vaccination.

Major Griffith (Chairman of the Sanitary Committee of Gloucestershire) said that he should not have presumed to take part in the discussion had he not been invited to do so by Dr. Bond. Gloucestershire had not appointed a M. O. H., so on him devolved the whole of his statistical work and he could claim to speak with some knowledge of the sanitary condition of that County. It might have been thought that Gloucestershire would have profited by the great object lesson of the recent epidemic in the City; but the contrary was the case, and it was now more anti-vaccinationist than ever. The Municipal Elections in November 1896 were contested upon this very question, and in every instance the anti-vaccinationist was returned. At the recent School Board Election Dr. Hadwin, the leader of the anti-vaccination movement in the City, was returned at the head of the poll. It was not to be supposed that the people of Gloucestershire were all to be included in the ranks of those whom Professor Corfield had termed *ignorant persons*. Their rejection of vaccination was due more to the manner and the circumstances under which it was forced upon them than to objection to the thing itself. Sanitary Authorities are of but little avail in enforcing a coercive measure which is irritating to the electorate. The trumpet of the Local Government Board gave but an uncertain sound and in those few cases where defaulters were brought before the courts the magistrates largely availed themselves of their discretion under the Act and refused to convict; in cases where they did, the penalties were not enforced. Consequently throughout Gloucestershire the Vaccination Acts had become a dead letter and a generation was springing up entirely unprotected. The Local Government Board Inspector had told him that a similar state of things prevailed generally throughout the South Midland District. He thought that Dr. Bond's suggestions to disarm objectors by removing those features in compulsory vaccination which pressed hardly upon parents were wise and practical. As an instance of the advantage of the school age for vaccination he mentioned the case of a Gloucester man, a pronounced anti-vaccinationist, who removed to the United States at the time of the epidemic. He sent his children to the public school and to his great indignation they returned home vaccinated. He waited upon the school master to remonstrate—there was a brief struggle—and he too was vaccinated.

Dr. F. Vacher (M.O.H., Cheshire) had very much pleasure in rising to support the recommendations made by Dr. Bond. Speaking as a Medical Officer of Health of long experience, and also as a public vaccinator of many' years practice, he could say he was in accord with every one of the recommendations which had been made. Dr. Bond had referred in going over the report of the Royal Commission to nearly every matter of importance, but there was one matter he (Dr. Vacher), would like to emphasise, which he thought had not received sufficient attention. That was the proposal of the Commission that henceforth vaccination should be in charge of the Sanitary Authority. They knew that at present it was placed in charge of the Poor Law Authority, the Guardians appointing the vaccinators and arranging the salaries, and everything in fact resting on them. In order to see that the vaccinator did his duty, and that the Guardians were in no way remiss, there must be some sort of supervising authority. The Royal Commission thought, therefore, that vaccination would be done a great deal better if it was carried out under the control of the Sanitary Authority. At present, to take a single instance, the Local Government Board exercised its control by means of a staff of Inspectors who were not equal to the amount of duty which they were called upon to discharge. The result was that an Inspector was called upon to investigate an epidemic of, say, typhoid fever in one place, an epidemic of typhus in another place, and an epidemic of pneumonia perhaps, in a third place, and then he was told to exercise supervision over the vaccination of one or two counties, in fact to fill up his time by inspecting the vaccination stations. Such routine work brought with it no kudos. But if an inspector traced to its source an outbreak of diphtheria or typhoid fever, a printed report was issued and sent round to the medical press, and he got a good deal of credit for the skill shown. The result was that the inspector's time was devoted mainly to the discovering, or to attempting to discover, the origin of epidemics, and that when he came to inspect vaccination, he paid the stations a visit, say, once or twice in two years. As a public vaccinator he knew, as a fact, the inspector only came round at long intervals. If the recommendations of the Royal Commission were carried out, the supervising authority for vaccination would probably be the county authority, and the county medical officer would be charged with the inspection of vaccination. This officer would easily be able to accomplish the task of inspection of the different stations at least four times a year. The result of more frequent inspections would undoubtedly be that vaccination would be done much more efficiently than it was now.

THE PRESIDENT OF THE CONGRESS, (Dr. Farquharson), thought they had had a very excellent paper from Dr. Bond, who had taken a very great deal of trouble and waded through an enormous mass of blue-books to present them with his conclusions. The result of such labour must be to materially assist the framing of legislation for carrying out desirable improvements. In whatever they did they must remember that it was desirable that they should take the general sense of the community along with them, and try to get the public to have faith in their methods. The recommendations of the Royal Commission seemed to him to be of a very practical character. In regard to the imposition of repeated penalties he pointed out that it was already in the discretion of the magistrates whether such penalties should be imposed or not, and he thought it was a matter that might be left to the authorities. He entirely agreed in the desirability of postponing the age of vaccination to a certain point because there were difficulties in the way of persuading mothers to think there was no harm in the sores. The suggestion as to the re-vaccination of schools was very important, and in regard to public vaccination he thought that everyone should have the opportunity of being vaccinated, if he chose, with calf lymph. He attached very great importance to the preservation of the vaccine lymph with glycerine. Strict precaution in this matter had not always been used. In his own family he had suffered a good deal from vaccination. He lost a relative by vaccination improperly performed. The lymph having gone wrong, blood poisoning was set up. He thought it was a fact that vaccine matter, preserved in glycerine, was not only antiseptic, but its antidotal qualities were not decreased, but actually increased. They had had a good paper, and he hoped the discussion would be a good one, and one noted throughout the country.

Dr. J. **Clarke** (Hanley) said there was one alteration that he was pleased to hear recommended by previous speakers, and that was, to raise the age from three months to six, as the time within which vaccination of infants should take place. It would lessen the risk of transmitting disease, or of having diseases that have nothing to do with it put down to vaccination. There should be a definition of what successful vaccination was. At present a public vaccinator was instructed to vaccinate in not less than four places, and it is well known that for proper protection from small-pox, four insertions are necessary. There was a class of private practitioners who made a habit of vaccinating with only one insertion. Such imperfect vaccination brings the operation into disrepute, as it is not an efficient protection against small-pox. The general public would find out the necessity for vaccination when they were divided into two camps—a non-vaccinated and a vaccinated camp—without having, as exists now, a third, that was, an imperfectly vaccinated one.

Dr. **Woodcock** (Leeds), though a believer in vaccination, *per se*, was not surprised at the popular objection to vaccination as at present carried out. He wondered how people had put up with it for so long. Mothers had to go at inconvenient times to the vaccination office with their children and sit in dense crowds at all times of the year. Possibly there were epidemics prevalent and the children were vaccinated from others of whom perhaps nothing was known, and most important of all the youngsters were not seen again for a week, during which period, as the President had said, all kinds of accidents might happen. That he thought explained the objection felt by a great many parents, while another reason for the unpopularity of vaccination was the position of medical men on the question. Medical men as a body were scornful of all arguments put forward by the other side. The fact was that they themselves had been for generations inoculated with Jennerism, and naturally people who had not had this advantage were jealous of the way in which medical men looked upon the subject. Medical men were a most honourable but a most tyrranical body of socialists always ready to inflict upon others laws believed in and carried out by themselves.

Mr. **James Dick** (Chairman of the Health Committee of Glasgow) felt it to be his duty to say something on the subject. His only fear was that his observations would be of such a slight character that they would tend to the weakening of vaccination in the country north of the Tweed. A few years ago in Glasgow there was a very considerable epidemic, and they persuaded the people to have vaccination performed on them, and the Sanitary authorities spent between 31st May, 1892, and 31st May, 1893, a sum of £1,340 on Small-pox prevention, principally vaccination and re-vaccination. The principal items of this expenditure were:—

Lymph	£443
Fees to private practitioners	192
Fees to prison surgeons	262
Payment to lodging-house proprietors ..	361
Payment to parties who on account of vaccination were unfit for work	27

Board or free lodgings for a week to every lodger in the Corporation Lodging-houses, the cost being borne by the Lodging-house Committee. At the same time they paid to the medical men connected with the prisons 1s. for each prisoner vaccinated. They felt considerable alarm, however, in regard to the tramp population, recognising the danger which attended from going about from place to place, especially if they were not properly vaccinated. There were a good many lodging-houses in Glasgow, and they induced the inmates to allow themselves to be re-vaccinated, giving them in return a week's free lodging; and, if at the end of that time they were unable to work, they were paid 1s. per day for one, two, or even three days. Only on the previous Monday he had signed documents for the payment, one for £4 and the other for £3, for re-vaccination carried out on prisoners. This work was done five years ago, and they had just started the same thing again when they were threatened with another outbreak. The first case was reported on the 30th of May, and the highest number reported since on any day was 28; a very small number indeed, and a result, he thought, of the re-vaccination which was done five years ago. He believed that they would stamp out small-pox in Glasgow. In regard to the carrying out of vaccination, he thought it well to have calf lymph, but vaccination should be accepted completely. As a layman he thought they seemed to be somewhat "mealy-mouthed" in the matter. In the west of England they were generating a state of things which was a danger to the whole community; and for the protection of the national health, he thought a considerable amount of pressure ought to be brought to bear upon those who objected to vaccination. They were few in number, but they were noisy. He thought that, with the exception of one or two here and there, there would be no difficulty in carrying with them the voice of the people. "A stout heart for a stiff brae," as they said in Scotland, and he thought in the portion of England already mentioned the people needed stiffening. He thought that conference would help to stiffen them; and, if they took to the work in courtesy, they would carry it through. Some of them were old enough to remember what a number of people they met in the street whose faces were pitted with small-pox, and now they were happy to say that such a thing was almost unknown in England. Let them work on in the determination that whatever scourge might ravage the country, that this terrible disease of small-pox should not be allowed to do so.

Dr. **Beveridge** (Aberdeen) said the last speaker but one had referred to the tyrannical conduct of medical practitioners in connection with vaccination. He thought the speaker scarcely appreciated the exact circumstances under which the State action was brought into play. They had a duty to protect the community against the unprotected child, and secondly to protect the child against its parents' ignorance. It was quite true that practitioners treated with some contempt the arguments which were used against vaccination; but on the other hand he would point out that when they looked into the facts and compared the statistics and arguments in favour of vaccination with the flimsy case put forward by their opponents, it was rather natural to be a little contemptuous. Dr. Farquharson, he thought, would agree with him that it was the general experience of sanitary and medical practitioners, that while undoubtedly there were certain risks attending the carrying out of vaccination as there were in every minor surgical operation, these risks were infinitesimal.

Dr. **Farquharson**: Yes.

Dr. **Beveridge** (continuing): As to the risk attending vaccination, he might say that he had had cases under his own observation where, owing to carelessness, a number of children were vaccinated from a syphilitic vaccinifer, and it was found that not a single case of syphilis occurred, so that the risk was infinitesimal. In regard to the carrying out of the law he quite agreed that the body to be charged with its administration should be the local authority, which was in every way a suitable body. He must confirm what had been said by his friend Mr. Dick as to the danger of weakening the position of vaccinationists in Scotland, arising from the report of the Commission. The public did not appreciate the significance of the report as supporting vaccination. He would draw their attention to the fact that only those who entered the inquiry with a strong feeling against vaccination had adhered to their view, every one of the indifferent members had agreed as to the efficacy of vaccination and that appeared to him very strong evidence in its favour. In Aberdeen they had had an unfortunate experience owing to the report of the Commission, it having been decided that pending future legislation no action should be taken, although he should have thought that public men would have understood that legislation did not necessarily follow the report of the Royal Commission. The Parish Council of Aberdeen had resolved to suspend the operation of the vaccination laws. Speaking as a general medical practitioner he wished to drive home the argument in favour of taking the practice of vaccination out of the hands of the private practitioner and putting it into the hands of the public vaccinator. He himself felt he had to induce the parent or else the parent went elsewhere. Medical men were the creatures of economic forces and could scarcely resist them. In support of this argument he adduced the case of the Aberdeen Public Dispensary. Some years ago vaccination was carried out by general medical officers, who took their turns day by day, but during the last few years they had had vaccination carried out by a public vaccinator at the dispensary. The result had been a great fall in the number of cases applying for vaccination at the dispensary, its unpopularity being due to increased efficiency. He would not support the imposition of cumulative penalties, and at the same time he would like to see some relaxation where it was practicable. They had strong anti-vaccinationist organisations, very few but very active, and if they were to carry into law proposals for exemption in a simple declaration by the parent, the result would be that their opponents would make a house-to-house canvas, and would stir up a vigorous opposition. He should be glad to know if that view was shared by Dr. Bond.

Dr. J. Spottiswoode Cameron (Leeds) very cordially supported the recommendations of his friend Dr. Bond. Not many weeks ago the Council of the Yorkshire Branch of the Society of Medical Officers of Health invited the public vaccinators of Leeds to meet them in Conference on this subject. Some of them put before the meeting very nearly the same propositions as had been thrown out by Dr. Bond, but they found themselves in a very small minority. Most of the public vaccinators were in favour of the law as it stood at present and would not listen to any proposal for extending the age or the relaxation of penalties. He (Dr. Cameron) was, therefore, very glad to find that the temper of the present meeting was absolutely otherwise. Medical men were largely to blame for the "impasse" which they had come to. They had been content to rely too much on legal enforcement instead of using their influence to persuade people to get their children vaccinated. He took exception to the recommendation in Dr. Bond's paper which would require objectors to vaccination to go before the magistrates rather than before the local authority. He thought that would be a mistake, as if the cases came before the magistrates there would be counsel appearing, and sensational reports would be published in the newspapers. Whereas if they were to do the work "in camera" before the local authority persuasion would have more influence and they would do more good than by going into open court. There was another way in which good might be done, and by which they might have compulsion without compulsion. They knew how necessary it was that in a house where a case of small-pox had occurred they should carry out vaccination, and in a large number of cases, where they had a practitioner who would take the trouble, they got that done, but where he would not they did not. In Leeds some years ago they had a considerable number of cases and what they did was this; they took the patients to the hospital and then asked the people to remove to cottages provided for them, while their clothes were being disinfected. Then the resident medical officer at the hospital (Dr. Pearson) persuaded those people, with few exceptions, to agree to re-vaccination. There was another difficulty, however, namely, the sore arm which occurred when they were vaccinated with calf lymph, but the Corporation came to the rescue and paid the people part of what they would have received in wages. They kept them, boarded them, and paid them half what they would have earned for the period they were in quarantine, and so they were able to prevent the outbreak spreading—a most important thing in Leeds where clothing was sent away to all parts of the world. An epidemic such as occurred at Sheffield would have ruined Leeds.

Dr. J. F. J. **Sykes** (London) said he wished to look at the question from two important points, the standard of vaccination and the standard of compulsion. Firstly, they had not yet had proper and complete vaccination. The gentleman from Aberdeen, who had spoken, put that strongly, and everyone knew how difficult it was to get clear and precise information as to the facts. There was a large amount of vaccination which was not really vaccination, so that the first thing they had to do was to get a standard of vaccination, and that he placed before everything else. The law should set out clearly what "vaccination" really meant. Let them once get a definite indication of what was required to be done, and the use of calf lymph, and they would have gone a large way towards fighting successfully the battle against small-pox. Secondly, in regard to compulsion. He rather looked upon the report of the Royal Commission as a superficial view of the case. He would tell them why. When vaccination was first introduced what was it that made people get vaccinated? Vaccination was not an operation which one underwent from choice. The reason why people sought it in the early days was because small-pox drove them to it. Then a little later they asked themselves, "Why wait for small-pox to make us get vaccinated?" and so they reached anti-epidemic vaccination, and then compulsion, which was made stronger and stronger until they reached the present position, and now they are gradually sliding back again. At present, the question was, were they going to have compulsion by the dread of small-pox, or compulsion by legal penalties, or compulsion by militant force, that is, were they going to the extent of which Earl Percy spoke at Newcastle last year, when he said that the only form of ultimate compulsion was the taking of the child from the mother's arms and actually vaccinating it. It was a question therefore for the public of this country to decide as to what form of compulsion should be established. The medical profession had stood aside on this part of the question, but they could scarcely find a medical man now who did not express an opinion in favour of some form of compulsion, as they would have small-pox introduced into the community if they did not vaccinate. He did not want the heart of the matter to be frittered away in details as to whether, for instance, they should have a written or make a verbal statement before the magistrates in case of prosecution, but he wanted them to take in a more philosophic spirit the question of the form that compulsion should take, and especially to urge that it should be a form which those who practise preventive medicine could commend to acceptance. Briefly put, mere persuasion is useless, as people are not vaccinated for pleasure, but for fear; the only effectual impulse, therefore, is fear, and the only question to decide is the kind of fear, whether it is to be disease, disqualifications, penalties, or actual force. This is what has to be decided.

DR. CHARLES WATERS, Medical Officer of Health, Southend-on-Sea, said he had been very much struck with the remarks of Major Griffiths. He thought they might learn a great lesson from what had been said in reference to Gloucester. He considered a change in the law was most advisable, for the present system was most unsatisfactory. At present people went and said they wanted their children to be vaccinated with insertion simply in one place, and when they found it must be done in four they said they would not consent, as they knew of medical practitioners who only did one. He thought that illustrated the necessity which existed for a public vaccinator to whom vaccination should be solely entrusted. Another thing was that medical practitioners, as a rule, had treated arguments raised by opponents of vaccination as worthless. It was impossible to be blind to the fact that syphilis had been transferred through vaccination, and he hoped that the medical profession would see the desirability of taking public opinion more seriously, because there was no doubt that a good case could be made out for vaccination, and thus it might be unnecessary to attempt much in the way of compulsion.

DR. ASTON (Eccleshill) emphasised the importance of effective vaccination. Vaccination with only one mark could not be considered to come under that description. Their friend from Aberdeen had referred to the economic forces of which medical men were the victims. He (the speaker) would also advocate the transfer of the carrying out of vaccination to the sanitary authority and a public officer. As to compulsion, he never heard of any individualistic radical who thought that when a case of small-pox occurred the sanitary authority ought not to compulsorily intervene to prevent the spread of the disease to the community, and he asked therefore, why they should not interfere beforehand as a preventive? In his district there had been several outbreaks since 1874, yet in no case had the small-pox spread from the house where it first broke out, a result entirely due to the preventive action of the sanitary authority, who had not only effectively isolated each case, but latterly had provided calf lymph for the carrying out of re-vaccination, and had also taken the precaution of treating any houses within a certain radius of the infected house as being possibly infected, and so far as they could, of having everybody vaccinated within that area.

DR. E. SEATON (President of the Society of Medical Officers of

Health) expressed his best thanks to Dr. Bond for the able arguments which he had put before them. He felt it had instructed all of them, and enabled them to see the matter clearly. The question had been long before him (Dr. Bond) at Gloucester, where it appeared that they had such unusual difficulty in carrying out the vaccination laws. For his own part, he, Dr. Seaton, did not understand fully the reasons of this opposition. It was certainly dispiriting to hear the chairman of the Gloucestershire committee saying that, notwithstanding their recent terrible visitation, there still existed so much opposition to vaccination. Despite that circumstance, however, he hoped that a similar feeling would not prevail in many other parts of the country. He expressed his concurrence with Dr. Cameron, and he thought that what might be appropriately termed Medical Sanitary Organisation (as he endeavoured to explain in the address which he gave to the Conference of M.O.H.) was a powerful auxiliary to some form of compulsion in primary vaccination. Perhaps there he was a little at variance with Dr. Bond. The recommendations of Dr. Bond were so carefully thought out, and so very exhaustive, that anybody speaking immediately after him would hesitate to criticise them adversely. At the same time it was plain that they involved the concurrence of three different classes of persons, first of the magistrates, then of the educational authorities, and lastly of the body he was then representing. the medical officers of health. He hardly liked to speak with authority at the present moment, because they had themselves issued circulars, with a view to obtaining the opinions of all their branches upon the various points, and they had not yet made up their minds. Dr. Bond seemed rather impatient of the attitude of the medical officers, but he, Dr. Seaton, claimed for their position that it resembled one of "masterly inactivity." There was surely no such great hurry to alter Acts, which, on the whole, had worked well for many years, and as to the beneficent operation of which a Royal Commission had testified, after an investigation lasting for seven years. When they began tampering with the law there was no saying where they would end, and therefore he thought it was a wise remark of the President of the Congress, and one worthy of the greatest consideration, that if they made any alteration of the law, the alteration should be as simple as possible, and in the direction of lengthening the time during which vaccination could be carried out. Dr. Farquharson had already pointed out what was done in Germany, a child need not be vaccinated before it was one or two years of age. If this plan were adopted a great deal of the opposition that was at present raised by parents to the carrying out of the law might subside, especially if the Medical Sanitary Organisation throughout England were materially improved, and, as a consequence of that improvement, fairly well vaccinated towns throughout the country ceased to become from time to time the scene of epidemics of small-pox. These epidemics have been considerable, though not of course of any such magnitude as those which had occurred during the last few years in the unvaccinated towns of Montreal and Gloucester. He thought Dr. Bond and other gentlemen who had contributed such valuable remarks during that discussion would have helped Medical Officers of Health to arrive at a conclusion on a subject, which, in his opinion, ought not to be brought before the legislature without full consideration, especially on the part of those who have the responsibility of dealing with outbreaks of epidemic disease.

Dr. T. W. Hime (Bradford) said he feared, from the unstinted applause which had been given to Dr. Bond, he would be as "the voice of one crying in the wilderness," in differing on any point from that gentleman, the excellence of whose paper he gladly recognised, but he was very unwilling that some of his observations should go forth to the public without criticism. Dr. Bond considered the law at present to be very culpable and very harsh in some respects, and he stated that the treatment of the poor man in reference to vaccination, compared in some instances unfairly with that of the rich man. Dr. Bond said it was a very unreasonable and unfair thing that the rich and the poor alike should be liable to a fine of £1 for neglecting to have their children vaccinated, but he (the speaker) did not consider that it was unfair that there should be exact equality of penalty where the offence was identical, and he would ask, did they consider that the law was guilty of partiality, when it sentenced a rich man to be hanged for murder just the same as it sentenced a poor man. The law made and could make no distinction between rich and poor; its penalties must be adjudicated impartially, the same to all alike. Dr. Bond had further said that it was a grievance to the poor man, and showed partiality to the rich, that the rich man could get his child vaccinated with only one insertion, whilst a poor man's child had to receive four insertions if he went to a public vaccinator. He did not know that four insertions were compulsory. They certainly are approved of by the Local Government Board, and by all who understood vaccination, and experience showed that at least four insertions ought to be made in order to give reasonable protection. Was it a great privilege if the rich man could induce his doctor to vaccinate his child inefficiently with one insertion, while the Government endeavoured to get the poor man's child thoroughly protected with four? He was in favour of public vaccinators, who should devote the whole of their time to the work undertaken. The work of vaccination languished throughout this country. Private practitioners did not care for the work, and many of them did not perform it thoroughly, as was abundantly proved by the greater protection observed during epidemics among those vaccinated by public vaccinators. Private practitioners were liable to yield to the parent's request to make only one or two insertions, partly from a wish to gratify their patients, partly, he feared, from want of knowledge and conviction as to the critical importance of the number of insertions. This meant very inferior protection, as protection was proportional to the number of insertions. In his evidence given before the Royal Commission on the subject, he (Dr. Hime), had advocated the opinion that it was very desirable to have men giving the whole of their time to the work of vaccination, who would have nothing else to consider but the best means of promoting vaccination.

Dr. Bond seemed to have left out of his view altogether in dealing with Germany, where the success of vaccination was so strongly demonstrated, that there compulsion was the "be all and end all" of the national system, vaccination and re-vaccination being alike compulsory, with a third compulsory vaccination for all sailors and soldiers, and many other state servants. One result of this was that during the invasion of France, which was scourged by small-pox at the time, the German troops escaped almost entirely. It was very pleasant for him to hear from the gentleman from the other side of the Tweed, who had spoken, that what was wanted was only a little more backbone on the point in England. That gentleman was quite right. It was lamentable to see how Boards of Guardians, for fear of losing office, hesitated to carry out this most salutary law of vaccination. They did the wrong thing in order to get a little popularity, but unfortunately the highest authority in the land, the Local Government Board, set them a bad example in that line of action. It was quite refreshing to hear that people in Glasgow were not driven to vaccination merely by the fear of small-pox at their door. Two or three years ago there was a striking illustration of the contrary state of feeling to be found in Halifax. It was then a great anti-vaccination centre, and men were elected to public offices on the anti-vaccination ticket, and the vaccination station was closed as it was not used. A very severe epidemic of small-pox then broke out, and when calf vaccine was provided, but not till then, people came in a rush to be vaccinated, and about a thousand were done within a few weeks. It was not to vaccination *per se* that the people chiefly objected, but to the sting of compulsion and to the use of human vaccine. But compulsion must be applied if they were to have anything done, and the objection to human vaccine would be removed by the provision of calf vaccine. It was a grievance that the poor could not get calf vaccine, and were obliged to pay for human vaccine, which they objected to, and which the rich would not use. In regard to medical men taking an active part in preaching up vaccination and meeting anti-vaccination stump orators, he did not advocate it. Occasions might occur in particular localities where it might be desirable, but a scientific lecturer could never beat the stumper, who persuaded the ignorant by the very outrageousness of his mis-statements. He thought it a great mistake that medical men without experience, whose habits of thought and life were the very opposite to what was required for efforts in devising penal legislation, should undertake to legislate for vaccination. They should be content to expound the effects of vaccination and of small-pox and let others deal with compulsion, fines and the machinery of the law. It was not within the knowledge of medical men how best to draft legal enactments. That required special training, and medical training and practice did not impart it. As to the postponement of vaccination to the school age which had been stated at five years he would remind them that the school age in Bradford began at three years for many thousands. He supposed the same pernicious practice prevailed in other places

&c. This fact he regarded as lamentable for the children. In Germany the age for compulsory school attendance was seven, that is two years later than in England. That was quite early enough for tender children to go to school for five hours a day. He thought it would be a great disadvantage if vaccination was postponed to that time, for it would tend to withdraw the children from school during the period necessary for vaccination, and create an obstacle to their education. Besides vaccination was much more satisfactory in infants, and caused less derangement than in older children. As to re-vaccination, that had been long approved of by Government, in theory, like many other good things, but in practice the regulations prevented it. A public vaccinator got no fee if the person re-vaccinated was under age, but he had no means of verifying the age; he got no fee unless the re-vaccinated person was inspected as to the result, but the law did not require the re-vaccinated person to return for inspection, and he naturally avoided the trouble; finally a smaller fee was paid for re-vaccinating, yet the proper performance of re-vaccination required just the same amount of skill and time, and the same amount of vaccine as a primary vaccination. Furthermore, there is no incentive to a working man to get re-vaccinated; he saw it universally neglected, and no effort made to have it carried out. Could he then be expected to lose time to undergo the operation, and also to come another day to show his arm? In every civilised country in the world which successfully dealt with vaccination there was an efficient system of compulsion. Why should they not begin by adopting the system which had been found everywhere else to be necessary and beneficial? Dr. Bond lavished praise on the German system, of which compulsion was the mainspring, yet decried compulsion for England. It was not to be denied that compulsion was found necessary and was carried into practice in every country where vaccination was carried out with success. The reason was obvious. The millions of uneducated persons, who did not understand the reasons for vaccination, had to be compelled to get done, just as they had to be compelled to send their children to school. The educated classes everywhere needed no compulsion; they got their children vaccinated spontaneously, just as they got their children educated, without being compelled by law to do so. The statutory liability created by the law to get vaccinated was no more unconstitutional than the statutory liability to send one's children to school, or to pay income tax.

Dr. Bond (Gloucester), replying on the discussion, said that there still existed amongst the public a want of acquaintance with the actual condition of things, and what they needed to consider was not so much what was theoretically possible, but what was actually practicable. They would all be glad if it were possible to enforce vaccination within reasonable limits. With reference to the point which had been raised by Dr. Beveridge as to the influence likely to be exercised by the opponents of vaccination in dealing with the question before the magistrates, and also as to the urging of grounds of objection, his conviction was that for some time probably the organised opposition which existed at present, and of which he had as much knowledge as anybody during the last twelve months, having been in constant contact with it, would continue to exist, but it would gradually collapse. The general course suggested by the Commissioners was that of making vaccination easy, and showing consideration for reasonable objections. In proportion as that policy was carried out, so would the organized antagonism which had gradually grown up, disappear. If it were not for this organised opposition, that of the individual would be easy to deal with. He thought it right to say one word with regard to the criticisms on the report of the Royal Commission. In common with a number of others, when he first read that report, his feeling was that it was a weak-kneed and unsatisfactory document, but the more he read it the more he realised the conditions under which it was drawn up, and the more he became convinced of the judicial way in which it was expressed. Anyone who would take the trouble to look through the mass of evidence which the Commissioners had had to consider and reject, could not fail to appreciate the judicial caution and the degree of wisdom which had been displayed in the general drafting of the report. He would not venture to discuss the very numerous points that had been raised. Some of them had been answered by subsequent speakers, and he would simply content himself by thanking them for the general sympathetic tone with which his paper had been received.

"*Operation of the Housing of the Working Classes Act in Leeds,*" *by* GEORGE F. CARTER, A.M.Inst.C.E., Assistant Engineer (Insanitary Areas), Leeds,

(MEMBER.)

As many towns appear to be wishful to put into effect the Housing of the Working Classes Act 1890, the author thought it would not be out of place to state what the experience of Leeds so far has been.

THE "YORK STREET" INSANITARY AREA.

At a meeting of the Leeds City Council held on April 3rd., 1895, the Medical Officer of Health (Dr. Spottiswoode Cameron) presented an official representation in terms of the Housing of the Working Classes Act 1890, setting forth *inter alia* that in an area within the City of Leeds bounded by Marsh Lane, Kirkgate, Vicar Lane, North Street (part of), Hope Street, St. Mary's Street, and Rider Street, certain houses, courts, and alleys are unfit for human habitation; and that the narrowness, closeness and bad arrangement of houses and groups of houses within such area, and want of light, air, ventilation, and other sanitary defects, or one or more of such causes, are dangerous or injurious to the health of the inhabitants either of the buildings in such area, or of the neighbouring buildings, and that the evils connected with such houses, courts, or alleys, and the sanitary defects in such area, cannot be effectually remedied otherwise than by an improvement scheme for the re-arrangement or reconstruction of the streets and houses within such area, or of some of such streets or houses.

After considering the same the Council passed a resolution [illegible] that an Improvement Scheme be prepared.

The area included in the official representation is about seventy-five acres in extent, and comprises some of the worst and most densely populated properties in the City. It has a population of about 15,000, lies east of Briggate coming to within about 120 yards of that important thoroughfare, and north and east of the Markets. The average death rate within the area prescribed for the years 1893, 1894, and 1895 was [illegible], and for the whole city 20·26, this latter figure of course including the insanitary area within it.

The Sanitary Committee to whom was delegated the responsibility of preparing an improvement scheme, came to the conclusion that it was too large an area to be dealt with in one scheme and in one application to Parliament, as compulsory powers of purchase are usually only for a period of three years.

The whole area for this improvement scheme is considered as vacant land, all the existing buildings, with few exceptions, having to be demolished, as it is intended that the lines and levels of the new streets shall be carried out irrespective of the present state of affairs. This will entail considerable excavations, which in places will amount to a depth of 20 feet, the filling being deposited in existing depressions.

With the above considerations in view, the committee decided upon taking in hand about twenty-three acres of the south west portion of the area, where the excavations and fillings are about equal in quantity; and although fitting in when completed with the proposals of the remainder of the large area, this will be a complete scheme in itself. Included in this area are several large mills and factories, a church and a graveyard which, with the exception of two strips required from the latter for street works, are excluded from the operations of the scheme; this leaves a net area to be first dealt with of 16¼ acres, which is called the "York Street" Insanitary Area.

This scheme was approved by the City Council, October 2nd, 1895, plans and referencing work were commenced, and the petition duly deposited the following December. After strenuous opposition from a few interested persons at the local enquiry, and also before committees of both Houses of Parliament, the Provisional Order was confirmed, and became an Act on the 14th of August, 1896.

There are in the "York Street" Insanitary Area:—

567 buildings occupied as dwelling-houses (including 11 cellar dwellings and a few small shops) by persons of the labouring class;
38 dwelling houses other than above;
97 dwelling houses and shops;
35 registered common lodging houses;
15 public houses;
1 Sunday school;
1 Roman Catholic chapel;
1 police station; and
159 other buildings (such as workrooms, warehouses, offices, &c.) comprising 97 premises.

At the time the return was presented to the Local Government Board, December, 1895, there was a population of 3,119 of the working class occupying 654 houses.

Of these, 755 lived in the 35 registered common lodging houses, thus leaving 2,364 persons occupying 619 houses. Of these houses 119 were let in some special way, either taken with shops or with yards, or the occupier worked for the owner or the owner let off the houses as furnished lodgings at so much per room, or the houses were let in groups for this latter purpose or were unoccupied.

The remaining 500 houses were let as follows:—

Houses.	At per Week.	Houses.	At per Week.	Houses.	At per Week.	Houses.	At per Week.	Houses.	At per Week.
	s. d.		s. d.		s. d.		s. d.		s. d.
1	1 1	114	2 6	3	3 0½	1	3 6½	3	4 6
25	1 6	1	2 7	14	3 1	1	3 8	1	4 8
3	1 9	20	2 8	1	3 2	5	3 9	2	4 9
38	2 0	39	2 9	17	3 3	1	3 10	1	5 0
7	2 2	20	2 10	1	3 3½	16	4 0	1	5 4
14	2 3	1	2 11	7	3 4	3	4 3	1	5 9
15	2 4	75	3 0	46	3 6	1	4 4	1	6 0

The above rentals are gross, that is free to the tenant of rates and taxes.

Of the 2,364 persons mentioned above, 632 occupied furnished houses or lodgings, and consisted of people depending upon casual employment, who had no fixed abode, and changed their residence often daily, and almost at least weekly. Deducting these, there were left 1,732 who may be termed permanent residents.

For the purposes of the scheme, the "York Street" area was divided into four parts, the following being the population of the working classes, and the area of each :—

	Population of Working Class.	Area. sq. Yards.
No. 1.	795	15,677
No. 2.	875	25,800
No. 3.	681	17,556
No. 4.	768	19,382
Totals	3,119	78,415

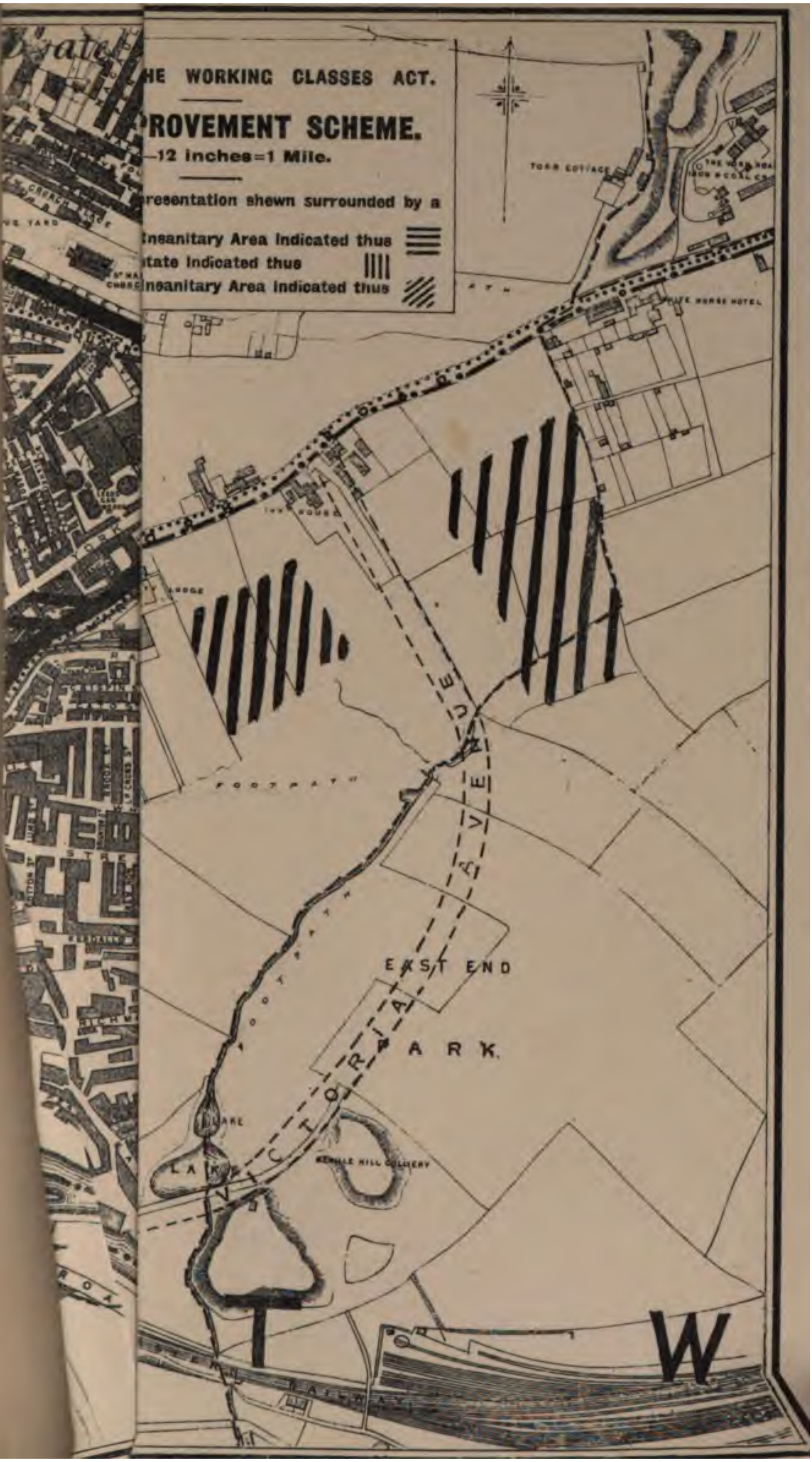
The total population of all classes was 3,844.

The work is to be carried out as follows :—The buildings on the first section of the area will be demolished, and dwellings afterwards erected for the accommodation of five hundred persons of the working class. The second section will then be cleared, and provision made for another five hundred. Then the third section will be dealt with, and provision made for one thousand, or in all a total provision of two thousand persons of the working class. Afterwards the fourth section will be cleared.

All dwellings whether erected by the corporation or by private enterprise must be in accordance with plans approved by the Local Government Board.

As to the site of the dwellings, it is not intended that all the accommodation shall be in the area itself, and as there may be some residents who if suitable small through-houses were erected on cheap land nearer the suburbs would avail themselves of the same, the committee wisely determined to arrange for the erection of about one hundred houses (to accommodate about five hundred persons) upon a part of the Ivy House Estate belonging to the Corporation.

This Ivy House Estate is situated in York Road about 1,600 yards from the first section of the area in an easterly direction and away from the town, and has the advantage of a tram service. The type of house it is proposed to erect on the site will contain suitable accommodation for a working class family, comprising a good sized kitchen or living room, a scullery with copper fitted in, two good bed-rooms on the first floor, and an attic. In addition, a cellar for food and coals or an outside pantry will be provided. Each house will have its own back yard, W.C., and Ashpit.


HE WORKING CLASSES ACT.
PROVEMENT SCHEME.
—12 inches=1 Mile.
resentation shewn surrounded by a
Insanitary Area indicated thus
tate indicated thus
nsanitary Area indicated thus
TORR COTTAGE
FIVE HORSE HOTEL
LODGE
FOOTPATH
FOOTPATH
VICTORIA AVENUE
EAST END
PARK
LAKE
LAKE
NEVILLE HILL COLLIERY
RAILWAY
YORK
STREET
T
W

With regard to the remaining fifteen hundred persons for whom accommodation must be made, a great question opens itself out, as some effort must necessarily be made to supply suitable accommodation for the very poorest class. The Area itself from its position in the town and especially its proximity to the Public Markets, is one in which many of this poorer class prefer to reside. The truth of this statement is proved by the present over-crowded state of the Area, and also the fact that there is scarcely an empty house in it.

There is a great need in Leeds for some really good common lodging houses, where, for about 4d. or 5d. per day, a person could have the use of a private and properly arranged cubicle to sleep in, and it has been suggested that the Corporation should erect such a lodging house to accommodate about 500 persons. As it will be necessary to provide for about 100 to 150 women lodgers, either two houses would be necessary, or, as suggested by the author, one large lodging house might be arranged so that while the sexes are properly separated yet, as the number of either sex fluctuated, by throwing certain sections separated by iron doors into one or another department, more or less additional accommodation could be provided. This would not be the case if the sexes were established in separate houses as it might happen that one or other place was full to overflowing and the other comparatively empty. Ample lavatories, baths, conveniences, and lodgers' laundries, and every other facility calculated to encourage personal cleanliness should be provided for the inmates. Such a place would, in the author's opinion, be a success from its first opening.

Having made the above provisions there would remain 1,000 persons still to be provided for, these it is suggested to accommodate in tenement dwellings and specially arranged through houses on the area.

Tenement dwellings or flats as they are commonly termed will be an innovation, as apart from one old-fashioned block, they are unknown in Leeds. To some extent the great number of persons occupying furnished houses and rooms points rather promisingly to the success of tenement dwellings. These people either on account of having only a small family, or on account of poverty cannot afford to rent a house, or from mistaken ideas of economy, rent only one room of a house and consequently have to submit to the inconvenience not to say indecency of using a common doorway, and frequently use another room or allow their own to be used as a common passage by the tenants of the other parts of the house. This is a state of things which should certainly be abolished, and if there were no other argument in favour of tenement dwellings is itself sufficient to make them acceptable. Besides, in what other direction can these people be given suitable accommodation at the same rents as those they are at present paying?

The Corporation could not, if they were willing, build houses similar to those in which the people now live, and as cheap, and the Local Government Board's stipulation is so stringent that ordinary single houses erected upon the cheapest land would be at a rental entirely beyond the reach of the people it is desirous of re-housing.

The tenements will consist principally of two-roomed dwellings at a rental of about 2s. 6d. to 4s. a week free of rates and taxes; there will also be provided smaller and larger tenements, consisting of one to four rooms each. A one-roomed dwelling will probably be let at from 1s. 6d. to 2s. 6d. a week. Each tenement will be provided with properly arranged food and coal stores and a convenient kitchen fire range; also nearly all one-roomed tenements and all two-roomed and over, will be provided with a separate copper, sink, dust-shoot or other suitable arrangements, and a w.c.

The ordinary tenement blocks should not exceed four storeys in height.

Another class of tenement which it is proposed to erect will be only two storeys high, and each tenant will have his or her front door opening direct on to the causeway at the street level. This is arranged by having four doors close together, the two outer ones belonging to the ground floor houses which will each contain two rooms, scullery and a back yard, and the two inner doors leading each by a flight of stairs to an upper dwelling, consisting of two rooms and probably an attic, with a somewhat smaller scullery annexed at the back, and this together with a small open yard will be placed over the scullery of the lower house. The dwellings will have separate water closets outside, and dust shoots at the back.

The above scheme is to be carried out under Part I. of the Housing of the Working Classes Act, 1890, which provides for clearing large areas of insanitary property. Under this part it will be remembered that upon the completion of an "Improvement Scheme," notice of it must be published during three consecutive weeks of September, October, or November, and a petition duly lodged somewhat similar to an application to Parliament under the Land Clauses Acts. This procedure as previously stated was adopted in 1895.

Under Part II. of the Act for a site too small to be dealt with as an unhealthy area under Part I., special facilities are offered Local Authorities and a less elaborate procedure is necessary. No preliminary official representations and advertisements are required. Notice of them may at any time after preparation be served on the owners, occupiers, &c., and when they have been sanctioned by the Local Government Board no confirmation of the scheme is necessary, if an agreement has been come to, to purchase the whole of the area. Where such agreement has not, or can not be made, notice of the order sanctioning the scheme must be published in the *London Gazette*, and again served on all the owners. If within two months after such publication any owner petitions the Local Government Board against the order, it requires the confirmation of Parliament. In cases where there is no petition or one is presented and withdrawn, the Local Government Board are required to confirm the order, and it comes into operation and effect as if enacted in the Act.

THE "CAMP FIELD" INSANITARY AREA.

This area had long been looked upon as a rather bad sample of slum property, and it was considered a favourable area on which to seek powers under Part II.

It is situated in the South East Registration District of Leeds adjoining the boundary of the township of Holbeck and consists of four unbroken rows of back to back houses of the old type, each 380 feet long. The outer streets bounding the area are fairly good, likewise the central street, called Middle Row, which is ten yards wide. But the spaces between the first and second and the third and fourth of the four rows have been filled in with back to back house property, conveniences, &c., in such a manner as to make not only themselves but the houses first constructed altogether dangerous and prejudicial to the health of the inhabitants.

These inner buildings it is proposed to demolish. Some houses are taken in the main blocks for the erection of conveniences in place of those demolished, and, as these new buildings will not be very high, such cross openings will assist the ventilation. With this latter exception the whole of the area, when cleared, will be left free and unbuilt upon, forming good court-yards, the houses facing into which will have as free ventilation and as much sunlight as those now fronting into the streets.

The number of houses taken is 59, inhabited by 238 persons.

An important clause in Part II. provides that the single arbitrator appointed by the Local Government Board, on application by the Corporation, shall have regard to, and make an allowance in respect of any increased value which, in his opinion, will be given to other dwelling houses of the same owner by the alteration or demolition of any buildings.

The Corporation did not propose in their scheme, under this second part of the Act, to make any accommodation for the displaced population, presenting evidence at the Local Enquiry as to the number of unoccupied houses within a certain radius. Nevertheless, in sanctioning the order, the Local Government Board have compelled the Corporation to undertake to erect ten dwelling houses upon a suitable site before commencing the work of demolition.

A plot of land has been purchased off Bath Road, Holbeck, within a quarter of a mile from the area. It has been kerbed and sewered, the plans of the houses prepared and deposited with the Local Government Board, and it is hoped that building operations will shortly commence.

Each house will contain suitable accommodation for a working class family, namely, a good sized kitchen or living room, a scullery with copper fitted in, and a pantry on the ground floor, two good bedrooms on the first floor, and an attic. Each house will have its own back-yard with coal store, w. c., and ashpit.

In conclusion the author expressed regret that no more could be said of work actually completed, but, nevertheless, a good deal had been, and was now being done in the preparation of the above schemes, in Parliamentary work, negotiations with property owners, &c.; and, as can be seen, Leeds is taking up the matter of clearing its slums in no small way, with good intentions of more to follow.

Mr. J. Munce (Belfast) said he was greatly pleased with the paper because it showed that while the Authorities in Leeds, he referred to the Leeds Corporation, seemed to be totally behind the age as regarded back to back houses, their officers were in the fore-front of Sanitary information of the present day. As they were aware, he had the honour of reading a paper regarding the housing of the working classes and, while the areas in which the houses referred to had been built were not insanitary areas in the first instance, still the two subjects were closely connected. He was glad to see that back-to-back houses were condemned in this paper and that the Local Government Board had been firm with the Leeds Corporation, and insisted upon through houses with yards taking the places of the back-to-back houses to be demolished and proposed to be rebuilt. Inquiry had shown that these back-to-back houses were a danger to the health of the city, and the visit he had paid to some on the advice of the Chairman of the Public Health Committee had only confirmed him in the conviction that *these* back-to-back houses were monstrosities which he hoped would soon be driven away from Leeds altogether. Sanitary Officers in Leeds had a very difficult matter to deal with in this insanitary area problem. While he had had a good deal of experience in dealing with insanitary areas under the Artizan's Dwellings and Housing of the Working Classes Acts he did not think he ever saw a scheme so large as this now laid before them taken in hand at once. They would find that if they took a small area and cleared it first they would do better than by taking a large one, as opposition would be reduced to a great extent when ratepayers saw the improvement such a scheme effected. He hoped they had not made the fatal mistake of making the streets too wide. It seemed to him that to make one long wide street through the insanitary area with smaller streets about forty feet wide off it, was a very much better way than to make all the streets wide; because if they were made too wide they were lost for shop purposes. They, in Belfast, widened one of the streets to sixty-five feet but found it would have been better to have made it fifty-five feet as first proposed. If the sides of the street were too far apart they practically became two streets for business purposes. The main street should if possible be just of such a width as to allow a double line of trams with sufficient space for traffic at each side. The housing of the working classes was a very difficult problem in Leeds because they had such a large number to deal with. It was a great pity they could not get the workpeople by cheap tram or omnibus fares away from the central parts of the city which were or ought to be too valuable to use for working-class houses. He saw it was proposed to deal with them by building houses three or four stories high. That was just the thing that should not be done. It simply meant crowding as many individuals as possible upon a few square yards, which was not the way to make a healthy town. It was very much better to have the central portion of the city entirely used for manufacturing purposes, shops, and other places of employment for the people and to allow them to live in the purer air outside. He had been making inquiries and found that land was not so dear in Leeds as he had thought. They could get land outside Leeds for 3s. per square yard in "fee." That worked out to something like £750* per acre in fee or £37 10s. per acre per annum. In a city like Leeds that was not an unreasonable price and houses could be built on such land and be made to pay 10 per cent., if properly managed, because they were doing so in other places. He would advise them to sell the land in the centre of the city for manufactories or other business purposes at reasonable prices. If that were done there would not be the same opposition to the improvement scheme as there seemed to have been in Leeds.

DR. A. T. GORDON BEVERIDGE (Aberdeen) said he felt the responsibility of criticising the action of the Leeds Corporation, because he had such imperfect means of becoming acquainted with the scheme. He had seen, however, that their action required criticism, and his criticism was directed in quite a different direction from that of Mr. Munce. His objection to the scheme was that it was not large enough. No doubt it was a very large scheme, but what were the actual facts summarised. They had had a report from their medical officer of health with regard to seventy-five acres of land, and in that area they had a death-rate of thirty-nine per thousand as against twenty per thousand throughout the city. In that area he understood they had got a very considerable proportion of lodgers. They had 1,300 lodgers out of a population of 6,000, a very large proportion. This meant that the death-rate was very much higher than it appeared to be, because in a population of lodgers they had an excessive number of adults, a circumstance which tended to pull down the death rate. Further, the lodgers would have few deaths occurring amongst them, because whenever a person fell sick he was removed to the hospital, or elsewhere, for separate treatment, and the death rate, which was admitted to be forty per thousand, ought, he believed, to be reckoned very much higher. Under these circumstances it seemed to him that the Leeds Corporation were taking a very serious responsibility in not dealing with the whole area. He differed from Mr. Munce when he said they were doing it cheaper in dealing with a small area, for though they minimised the opposition by dealing with a small area, if they were going to deal with the whole area, clearly the total cost would be greater if they took it piece-meal, than if they faced the larger opposition at once, and dealt with the area in one scheme. He wanted to hear some valid reason why the Leeds Corporation were leaving this large plague spot in the midst of their city, with a death rate, which, they must recollect, ought to be reckoned as higher, somewhere between forty and fifty per thousand. Mr. Carter said that one reason why they were dealing with only about one-third of the area was this, that they had to get their scheme through in three years. He was under the impression that the limit was five years, under the Housing of the Working Classes Act. It might be three, but in any case that did not constitute a valid difficulty, because, in order to get the scheme under the Housing of the Working Classes Act, they did not require to lay out the ground or even submit at the local inquiry, or to Parliament, a definite plan for laying out the ground. It was quite sufficient for them to propose to acquire the land and retain the right in their own hands, to decide afterwards as to what steps they would take in order to render the area sanitary. He might say that in Aberdeen they had fought out that principle, and they had fought it out in Edinburgh also, and had simply acquired the land without specifying any definite plan. They were fought very strongly on the issue at the local inquiry, it being urged that their scheme was really no scheme at all, unless they stated what they proposed to do. But they said that if they acquired the land, and undertook to render it sanitary, in conformity with the various Acts now in force, that was a sufficient scheme under the Housing of the Working Classes Act. Their contention was upheld, and they obtained their power in full. Now they had their duty to do regarding this area, and to the Leeds City generally, for it must produce a very serious effect on the surrounding parts of the city if these buildings, in the centre of Leeds, were allowed to exist. He thought it would have been wiser not to have made two bites of a cherry, but to go the whole hog at once and acquire the whole area, obtaining power to carry out the scheme by degrees, as they might find it convenient, and it might become necessary. They had, as a matter of fact, done nothing in response to the appeal of the medical officer of health as far as the remainder of the area was concerned. With regard to one or two other points, the question of the erection of new dwellings was an important one. He thoroughly agreed with what Mr. Munce had said, that the Corporation would have been wiser, if instead of putting up large and unsightly houses in the centre of the town, they had built smaller houses some distance from the centre, and thus provided accommodation in room of the accommodation destroyed by the scheme. The advantage of action of this kind was very great, because, in the first place, it removed the working man from the congested part of the city where he did not get sunshine and fresh air, to more healthy surroundings, and they were also able to give him better accommodation at a lower rent than they could possibly do in the centre of the city. Moreover, they avoided the odious Scotch system of tenement houses. They also placed their scheme on a more sound financial basis, because they could not get land at a reasonable cost in the centre of the city. If they went outside they could acquire land at a cheaper rate, and they could easily persuade a railway company that there was money in it if they gave very cheap fares for workmen in large communities situated on the outskirts of the city. They had the tramways in their own hands, and they could easily establish a cheap service to the centre of the city. Under all these circumstances he thought that it would have been a more satisfactory scheme to have gone outside to make their new dwellings. An objection might be taken, perhaps, that they had all their poor people who were readily shifted, and that it would be difficult to induce them to remove to other parts of the city. That was true, but it was a mistake in promoting a scheme for the erection of artisans' dwellings in relation to schemes for clearing out slums, to suppose that the tenants they were going to accommodate were necessarily the same tenants they were going to evict from the slums. It might be a question whether it was advisable for the Corporation, in any new enterprise, to undertake, from the outset, the most difficult class of tenants they had to deal with, who would probably destroy their property and place very great difficulties in the way of carrying out the scheme. As a matter of fact, in many of their cities where they had erected artisans' dwellings to take the room of houses destroyed, they had found that the artisans who entered the new dwellings, were of a class higher than those evicted from the slums, and these, the slum dwellers, removed into a somewhat better class of houses, formerly occupied by the people who went into the new Corporation artisan's dwellings. Thus they got each stratum of the community moved up a step, and that was a great advantage in itself. An important point in connection with the housing of the Working Classes Act had regard to the question of compensation. He thought Mr. Carter scarcely conveyed a clear idea of the advantages a great Corporation like Leeds possessed under that Act. Thus, under the Act, the Arbitrator was directed to take into account any improvement that occured from the demolition of the slums to other houses belonging to the same man—a partial recognition of the principle of betterment. The arbitrator was also forbidden to make any allowance in respect of compulsory purchase, and they also had the fact, that if the house was insanitary, the arbitrator was required to take from the compensation a sum sufficient to render the house sanitary, and in the case of a house unfit for human habitation, it was enacted that the compensation should simply be the value of the materials of the house and the land upon which it was built. He thought these were very satisfactory terms of compensation, and they should induce local authorities to go in more largely for schemes under this excellent statute than they had hitherto done. He hoped he had not been unduly critical, but if he had, he should be set right by members present. He hoped his criticisms would be accepted by the members of the Corporation in the spirit in which they were offered.

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*The actual figures are £726 per acre which at 5 per cent. would be £36 6s. 0d. per annum.

Mr. J. MUNCE (Belfast) asked to be allowed to offer a word of explanation. He must not have made himself properly understood. He did not mean to say they were not to go in for large schemes but that they should deal with a small area first and then having completed it take up another part. They could, he thought, in that way do it to better advantage than by grappling with the entire undertaking at one time, as the opposition was less formidable.

Dr. ASTON (Eccleshill) congratulated the city of Leeds on the scheme which had been described. He believed that the influence of Leeds would have its effects upon Bradford and that Eccleshill would get some benefit. He should like to know whether the scheme so far as the erection of the buildings was concerned was being carried out by the sanitary committee or by the building committee because he had heard it said that the two committees did not not always see eye to eye upon sanitary matters. He certainly thought that the plans and specifications should be approved by the Sanitary Committee as well as by the Building Committee, for they knew that in many towns a great deal of expense was often incurred in putting right what had been done wrongly. He hoped Councillor Womersley would allow him to compliment him on its having been decided to put windows into the water closets. There had been some talk about this matter in another gathering of Congress, and he had there urged that it should be compulsory to make such a provision. And he could not see why a window should be put into a w.c. and not into a privy. Light was a sanitary requirement and of great importance in localities inhabited by the lower class. If conveniences in such parts were not properly lighted the tenants using them, took no pride in keeping them clean, but if they were well lighted the tenants were shamed into keeping them respectable. He was glad to see that windows were going to be put into the conveniences to be erected near the Artisans' Dwellings in Leeds. But if they had been doing that at Eccleshill they would have made the windows larger. He should like to ask Mr. Carter whether the buildings mentioned in his paper would secure any protection from ground air in the basement and whether any impervious basement was to be provided, with damp proof courses. Every one knew that it was necessary to protect houses from the ground air as well as from the ground damp. Then as regards drainage they all knew that the Local Government Board model bye-laws compelled the disconnection of drains. If in his own district he noticed in plans that the drains went direct into the main sewer he pointed out that the model bye-laws did not admit of the practice. It was rather invidious that a large town should be able to make its own bye-laws, and that a smaller district should in that respect be under the control of the Central authority and subjected to criticism and oversight. He should like to ask whether in the houses mentioned in the paper the rainfall pipes were to be disconnected. And there was another point to which he should like to draw attention. He observed from the plan that the scullery of the house opened out of the bedroom. He did not think that was sanitary; it was not at all a desirable arrangement. He acquiesced in the criticisms of Dr. Beveridge, though he must admit that the Leeds City Council had done well in the matter. He further agreed in what previous speakers had said as to the undesirability of crowding so vast a number of people into the centre of the town as they would do if they erected those barrack-like dwellings which he understood were in contemplation. It would be much better if they could make provision outside where they could get more fresh air, then Councillor Womersley would perhaps tell him whether the waste pipes would deliver into the gullies. One advantage which he found from disconnecting the house drains in his own district was this; they employed a sanitary staff to clean out all the gullies and traps throughout the district periodically and he believed this had very greatly contributed towards the reduction of the death rate from diarrhœa. They could not get the lower class of tenants to clean out those things. He regarded the cleansing of gullies and traps as being quite as essential a part of scavenging as the emptying of ashpits. Gullies and traps were practically cesspools and they became a nuisance if they were not cleaned out. In conclusion he said he was glad to think that the City Council were showing much interest in the Dwellings of the poorer Working Class.

Councillor W. S. **Brown** (Edinburgh) said he did not care to criticise the policy of the Leeds Corporation in what they were about to do, because his own impression was, from what they had done in Edinburgh, that the Committee in charge of this great scheme would find their hands fully occupied for the time Parliament had given them to carry out the work. Therefore he would confine himself rather to making one or two practical observations, in the hope that they might be found useful to the Leeds body and others, who were carrying through similar schemes under the Housing of the Working Classes and the Artisan and Dwelling Acts. They had in Edinburgh just carried through a scheme not quite so large as the one of which they had just heard. They got the time extended to five years, and they had found up to now, that it had taken them all their time to get their work carried through. The first step they took, and he thought it a very wise step, was to have a careful supervision of all the licensed lodging houses throughout the city. The object of that was to find out exactly the condition of these common lodging houses, and they insisted upon them being put into a proper sanitary condition. Where they were not so, the opportunity was embraced of closing them forthwith. After that was done, notices were served upon the whole of the proprietors, in the areas to be dealt with. The Committee appointed by the Edinburgh Corporation had distinctly come to the conclusion, after trying various methods of acquiring property, that the best and speediest was at once to put it into the hands of one man, appointed by the Local Government Board. He was sorry now, after the experience that Edinburgh had had, that they did not adopt that plan at first. They tried negotiations and bought some £100,000 worth of property, but he was sure they would have saved considerably if the arbitrator who was ultimately appointed had been appointed to deal with the whole area at one time. One result of the examination of the common lodging houses was this, they had brought to the notice of the public in Edinburgh the condition of these houses, and a company was formed forthwith, which purchased and fitted up a very large tenement for a common lodging-house, to accommodate upwards of 300 persons. That was five years ago. Up to now they had never paid less than five per cent. They could have afforded to pay more, but they had never paid less. Their charge to the lodgers was 4d. per night. By taking tickets for the whole week the rate was somewhat reduced. He threw out this suggestion because he believed that, in Leeds as in Edinburgh, there must be individuals willing to form a company, and, in that way, perhaps relieve the Corporation from the burden of putting up common lodging-houses. One thing they felt was a hardship, and that was, to submit their plans to the Local Government Board; they held very strongly and very properly—his audience would say—that the local bodies were a much better authority than the Local Government Board, for judging of the kind of house required in the particular locality where they were to be erected. They had put up houses outside the area, in the hope that they would get a certain number of people to go out there. They had also put up houses on the areas cleared. They were in hopes at one time that there would be this levelling-up process referred to by his friend from Aberdeen, but while there might have been in some cases, and while there had been in some cases, a levelling-up tendency, still he was afraid there was a danger, from the experience they had had, that there was a levelling-down tendency as well, and so long as they had the public-houses so closely connected with it in these small areas, he was afraid this would continue. They had had a publican, who complained bitterly, that by the removal of certain small slum areas, he had lost to the extent of £20 or £30 a week. That was in a very small area, and probably their experience would be the same, and they would save hundreds of pounds if they could get some of these public-houses closed.

Councillor **Womersley** (Leeds) remarked that his friend, who had had a shot at him on the subject of back-to-back houses, had left the meeting. He had intended to reply to that gentleman, but as he had gone he would not touch upon that question. The fact was that, between back-to-back houses of the older type, and those that one saw at present, there was no comparison, and he thought fewer objections could be raised against those recently erected, when they took into consideration the enhanced value of land in Leeds. Another gentleman spoke of the cost of land, and said they could get it at 3s. a yard. That was all right enough. The land was there, but they had also to get the people there, and that was the difficulty. Let him say however, that the Corporation were fully alive to the importance of running early morning trams to the outskirts of the city, and they had started a five o'clock morning service to meet the requirements of the working classes of the city, so that the Corporation were doing all they could to meet the circumstances of the poorer artizans. But there was a class of people in the centre of a great city like Leeds, who, if they were taken away from the centre, were practically shut out from their livelihood. They were employed in the centre of the city, probably in connection with markets, and unless they could be there early in the morning, there was no source of livelihood for them. The work was of a very intermittent character. They scarcely knew in the morning whether they would get a job, as it was, and the Corporation wanted, if possible, not to remove them from the centre of the city. He thought that, in the end, they would adopt some form of tenement houses, but it would not be a very high one. Remembering the strong feeling there was in Leeds against tenement dwellings, they would never soar so high as their friends in Scotland in that respect. He would like their friends, who so generously criticised them, to realise the difficulties they had to contend with. One friend said they were not doing enough, but did he realise what it was to deal with 72 acres of land, in the centre of a great city like Leeds? Did he realise what it was to have to dishouse 15,000 people? The enormous opposition that would be engendered by the very fact of issuing notices to quit upon 15,000 people at one time?

Dr. **Gordon Beveridge** (Aberdeen) said that Councillor Womersley had misunderstood him. What he urged was that they should acquire the whole area to be cleared, and clear it away by degrees and from time to time.

Mr. Councillor **Womersley**, continuing, said that their scheme foreshadowed dealing with 75 acres, but for practical purposes, and owing to the difficulties in the way, they were only going to disturb one section of 16 acres at the time. He would like gentlemen to realise this too, that though they had not bought 6d. worth of property yet their trouble had been enormous; and their trouble in acquiring the whole of the land would be still more enormous, and they had consciences to deal with in Leeds that would be difficult to convince as to values. They had already offers of property which they could not entertain at all; the prices were so exorbitant, and he did not know that if they got an arbitrator down they would get on much better. He was rather depressed by the hugeness of the scheme and the difficulties at the present day, and he would rather their friends had encouraged them than that they had suggested that the Corporation were not doing enough. He assured them they were taking a very bold step, and were by no means sure yet of how they would succeed, the difficulties were so great. He should have been glad if some one had suggested some method of housing these people, because that was the point they wanted to get at. Mr. Carter had simply put down this plan as suggested ideas. They were waiting for an ideal model-dwelling to be foreshadowed by some earnest friend of the working classes. He believed Mr. Boulnois, in his lecture to the Congress, foreshadowed a scheme for such dwellings, and he believed his committee would turn their attention to it at once. He thought the feeling of the Corporation was not to interfere with private enterprise, but to allow the builder to build for the artizan a dwelling at a moderate rent, and to let the Corporation turn its attention to that class of people who could only pay a very limited rent. The only way he could see by which to meet their requirements was to provide some form of tenement dwellings. His friend from Eccleshill was glad to discover something good in Leeds; and he might tell him that they do *cleanse* the gullies in Leeds—they cleansed 10,000 a month—and he thought that would convince him they were not overlooking that important department of sanitary work in their public streets. He had been very glad to hear the criticisms that had fallen from their friends, but what they should value more was practical advice as to the best method of rehousing the people in our large Insanitary Area Scheme.

Alderman **Harrison** (Chairman, Health Committee, Sunderland), said the Chairman of the Leeds Health Committee had referred to the difficulty of acquiring land in an insanitary area. They had to deal with an area of a like kind in his own town, Sunderland: an area corresponding largely, he believed, to the one under consideration, both as to its locality, its density of population, and the high death-rate which had prevailed for many years. They found for practical reasons that their best policy was to divide their scheme into three, and proceed by steps. When they got their Order, and had to proceed to clear the property away, they went to work in this way. They had a valuation of the property by the borough engineer, and then employed an estate agent to make the valuation again for them, he not knowing the valuation which their engineer had arrived at. When he presented his valuation to them they found that it corresponded very closely to the one they had had previously, and they made terms with him to proceed at once to purchase as much of the property as he could at the valuation he had put upon it. They acquired in that way a considerable amount of property, some at the valuation, some at less, and some, perhaps. at a little more. They proceeded step by step, and had now completed the purchase of the whole property at a fairly considerable sum less than the valuation put upon it. He would put that plan against the plan of the gentleman from Edinburgh of proceeding at once to the Local Government Board for an arbitrator. If they could get the right man, who took an interest in the scheme, and was inspired by patriotic desire to see it succeed, he would spare no effort to acquire the property on such terms as to give reasonable grounds for believing that the scheme would be a success. They submitted their plans to the Local Government Board. There were obvious reasons why this should be done, but it had landed them in this difficulty, that whilst this scheme was undertaken because of insanitary overcrowding, the Local Government Board had laid it down as a condition that for the whole of the people displaced from that area provision should be made upon the same area again. They were consequently driven to the erection of these high dwellings that none of them liked, although their plan only showed three stories instead of the four that were required under the plans to accommodate the whole of the people, and the Local Government Board were, he believed, withholding their sanction because of their inability to accommodate on the area the whole of the people displaced. At any rate the Sunderland Corporation would do nothing whatever to reproduce on that area the state of things they had condemned. That was a very strong argument indeed for trusting the Local Authority to carry out the law. They would see the absurdity of the position, the absurdity of the Local Government Board requiring them to reproduce even in the faintest degree the state of things they were seeking to abolish.

Dr. **Walter Smith** (St. Pancras) said he should like to endorse what the last speaker had said, for they had had the same experience in London as they had had in Sunderland. They had a very large scheme before them. They had gone to the Local Government Board, and that Board had absolutely refused to allow them to go on unless they would re-house three-fourths of the people displaced. It was absolutely impossible in their case to do so. The ground was covered, every inch of it, for miles around. It was absolutely impossible. If they were to fulfil the conditions insisted upon, the last condition would be worse than the first.

Mr. G. F. Carter (Leeds) replying to the discussion said that one gentleman had urged that the main streets should not be made too wide, that they should be fifty-five feet and not sixty-five in width. They had, in Leeds, main streets of sixty feet. It was urged that people should not be housed in tenements, but rather that the Corporation should provide self-contained houses in the Suburbs, and take the people there in trams. Councillor Womersley had shown why it was desirable, and even necessary, to retain very poor people in the area itself. The Medical Officer of Health for Eccleshill asked several questions about plans. He was there more to give information about the scheme itself. With regard to the plans he might say the whole scheme was under the Insanitary Area's Committee which was a sub-committee of the whole Sanitary Committee, and not under the Building Committee. They had determined to put windows in the w.c.'s, two feet by one foot, and to have them made to open, in addition to a ten inches by ten inches air brick. They should give an impervious basement, with damp-proof courses. Their building bye-laws, at the present time, had nothing in them with regard to the construction of tenement-dwellings, and, in fact, if anyone else sent in plans for buildings of that class the committee would, he daresay, throw them out. Of course the Insanitary Area's Committee were under the special privilege, and if the private speculator were to submit plans for tenement dwellings, he would not be pulling down valuable property, but would probably be proposing to do it on vacant land, which was a different thing altogether. He agreed with what their friend from Sunderland had said with regard to the Local Government Board.

"*Hygiene in Elementary Education,*" *by* JAMES R. KAYE, M.B.

THE study of the laws of hygiene and the rules and observances by which health can be preserved and promoted has, I need hardly tell you, claims of far-reaching importance—in fact it is second to none—but at the same time has not received that attention by the community which it deserves, and therefore I ask the indulgence of this meeting while I endeavour in the short time at my disposal to renew the claims of hygiene as a necessity in our national system of elementary education.

In the "Times" newspaper of the 11th August 1891 the following words appeared:—"The most pressing work of sanitary reformers is now not to legislate but to educate; to make the mass of the people in some degree at least participate in the knowledge of the causes of preventible disease and death." The past 40 years experience of preventive medicine has proved conclusively that disease is the result of man's offence against natural laws, and further, that amongst the 500,000 deaths which occur annually in England and Wales, one-third at least are certainly preventable.

Take the loss of human life ascribed to consumption—a preventible disease arising frequently from ignorance of the laws which govern the development and progress of disease. Consider also the needless sacrifice and waste of life due to measles and whooping cough. On one occasion the Prince of Wales, in referring to these diseases, asked the question "If preventable, why not prevented?" This may be answered in various ways, but practically the cause may be ascribed to the want of the diffusion of knowledge of the elementary principles of prevention amongst the people. Sanitary progress may be stated to depend on two factors: first, the administration of sanitary law by the proper Authorities who are the custodians of the public health; second, co-operation and willingness on the part of the people in fulfilling the requirements of the law,—an object which cannot be expected so long as the people from want of knowledge fail to appreciate the immeasurable results of sanitation.

Until knowledge on any subject, however practical and important, is disseminated, but little is to be expected, for unfortunately men seldom act as well as they know, and never better. The remedy therefore against this condition of things would appear to be enlightenment of the people, perhaps easier said than accomplished, but still no reason for its neglect. The channels for the dissemination of knowledge are as varied as numerous, but my remarks refer to the agency of schools, and chiefly elementary schools, because in them we find children from seven to thirteen years of age who in the ordinary course of events will leave school at or before the latter age in order to earn their own livelihood and are not likely therefore to obtain the invaluable benefits of higher education. To reach these scholars, any knowledge of hygiene must be given in the school period. I do not wish to be understood as putting forward any extreme or exclusive claim on the part of hygiene. All that is advocated is that opportunity may be given whereby some knowledge may reach the scholar as to his future life and surroundings, and not as it now is, by haphazard, by disease and calamity, or by enforcement of the law.

The object of all education should be to teach boys and girls to observe and reflect as well as to recollect and repeat. It is not my purpose to enter into the question of how the human mind should be trained and informed in a proper system of education, but I maintain that a subject like hygiene is better fitted to assist us in our object than some of the branches of education now in vogue.

Hygiene requires no profound study, but consists simply of the known facts relating to the inter-dependence of man and his surroundings—those facts on which the *mens sana in corpore sano* depends.

I dare say that some who are present may think that the compulsory inclusion of hygiene—now dignified as a science—is not feasible as a part of elementary education. No doubt science has a learned sound, but do not such processes and conditions as combustion, gravitation, roundness and hardness belong to physical science? Yet these are daily taught, but when hygiene, the science of life, is advocated we hear murmurings about over-pressure at school. It is thought highly important to teach a child the nature of the earth,—that it is round—a most difficult conception for him to realize. What good can be derived from a study of the lion, the zebra, or the pelican, with which there is little possibility of ever coming in contact? How many of those who have struggled with the names of foreign places, mountains and rivers ever make use of these hereafter? We teach our children these and other branches such as drawing,—knowledge which cannot reduce one iota the ill health or useless sacrifice of human life, or in any way improve their social surroundings. Apart from the small proportion of children who are taught domestic economy and physiology we neglect in our educational system practical reference to many of the weightier matters—easier of realisation —which concern the life, health, happiness, and prosperity of the individual.

Education to be of use to the class for whom it is intended should be conducted with regard to the future life and needs of those who are under instruction. Hygiene meets this proposition; it suits all. The clergy in their sphere, the lawyer in the court, the engineer and architect in their work, and tradesmen too, would all benefit from some early tuition in the science of health, and would not the health officer often times have received greater encouragement if more of the members of our District Councils had had the early opportunity of instruction in the rudiments of health matters. The lessons of the laws of health are beyond all comparison of more consequence to humanity than the teaching of any other science that ever was. It has been said that the motto of teaching should be "for life and not for school" and it is a trite saying that "the child is father to the man." When Catiline would subvert the liberties of Rome he commenced by corrupting the minds of the youth, and so also the most efficient mode of working any great reform is to instruct, properly, the rising generation.

Another argument I would use. If the law forbids, it ought to provide the education of what it advocates. If the people are ignorant of the value of pure water, and on the other hand of the dangers of impure water, the benefits of a wholesome supply to a town cannot be appreciated. If people do not understand something of the nature of the laws by which infectious diseases originate and are disseminated the efforts of the Sanitary Authorities are materially minimised.

To none is information which governs healthy living more necessary than to the house-wife with whom rests the sweetness of home and the wellfare of her offspring. The excessive rate of infantile mortality of the present age is with just cause largely ascribed to the ignorance of the mother, who in nine cases out of ten is unprepared for this responsible position. Further, if a Sanitary Authority do not recognise the full effects of uncleanliness, say, of privies, or of adulterated and contaminated food, milk for example, how can we expect the proper enforcement of the law in that district. It has been argued that education must not outrun popular opinion, and no doubt the patchwork nature of our present sanitary laws may be ascribed largely to this idea. The indication would therefore be to keep popular opinion as progressive as, if not ahead of, the law.

Some may remark that the importance of hygiene has been acknowledged and point to the frequency with which its conclusions are ignored. Notwithstanding, for instance, all that has been said about fresh air, how common it is to spend hours in overcrowded and ill-ventilated rooms, to sleep in bedrooms devoid of means of ventilation, and to work in stuffy offices and insanitary workshops. Much of this apathy and neglect of health I consider arises because the mind of the individual has not been impressed at the most susceptible period of life, long before the ordinary pursuits of the world have engaged his attention.

In short, it is to little purpose that we devise remedies for the shortcomings of the people, or provide a science of health, if the great masses of the people who are so deeply affected, are, through want of knowledge, unable to sympathise or co-operate with the measures intended for their good. Hence my argument that hygiene should constitute part of the primary education of the embryo citizen so that he may become "a living part of the nation," a conscientious member of society, and a useful citizen in the full belief of the proverb that "a healthy cobbler is a better man than a sick king."

Dr. **Kenwood** (Medical Officer of Health, Stoke Newington) agreed with Dr. Kaye in his estimate of preventible mortality.

There were tens of thousands of deaths amongst infants every year that were unquestionably due to parental ignorance. The only way in which they could cope with this ignorance was obviously by education, and that was how the preventable infantile mortality would eventually be reduced. Education at the present day seemed to aim too much at adornment, and thus the plant was sacrificed for the sake of the flower. The very knowledge, which it was *essential* that a child should possess, was absolutely ignored in our present scheme of education; yet, it was more important than anything else, that a child should be taught the laws of health and disease prevention, and that female children should be taught something of infant rearing. The Educational Department had taken some note of this grave omission. Its conscience seemed to have pricked it a few years back, and it went so far as to introduce "hygiene" as an optional subject, but it had never been pressed upon the scholars in the London Board Schools. He had taken the trouble to ascertain that not more than one per cent. of the children were ever taught anything of hygiene, and the one per cent. who were taught, were taught a form of hygiene which, to his mind, was absolutely useless. Elementary facts as to the laws of health and the rearing of offspring were practically neglected, and a child was taught a lot of useless and uninteresting facts of histology and physiology. The necessary object lessons which should be given to children, which, after all, impressed them more than anything else, were absolutely ignored, and in the London Board Schools too little pains were taken to apply the principles of hygiene to the surroundings of the scholars. There was a general lack of ventilation, and the very elementary principles of hygiene were ignored in other respects. Important as the subject was, before it could be advantageously taught in schools, it seemed to him to be absolutely necessary to train the teachers to know what it was important to teach, and to select those who were capable of teaching it, and were prepared to give the necessary object lessons to the scholars. He regarded Dr. Kaye's paper as the most important that had been read at that Congress, for it pointed to a measure which, if included and properly carried out in our education system, would do more in the prevention of disease, in his opinion, than any other dozen measures that could be suggested.

Dr. Aston (Medical Officer of Health, Eccleshill) said he formulated a proposition many years ago, that Hygiene ought to be taken up by the Education Department as a necessary part of their Elementary Education System, but they had not realised that necessity in England yet. They had to remember it was a uniform movement that was wanted, and that it was because of the absence of a uniform movement that they had all this friction and the opposition they had to encounter in their work as sanitary administrators. There was the example to which Dr. Kaye had referred, and again, it was impossible to convince the people of Yorkshire that measles was a dangerous infectious disease. It did not matter how clear their facts were, in dealing with grown up people they made no impression upon them. They must have a kind of preliminary information if they were to grasp what medical officers wanted them to see. The mortality from measles in this country was 23 per 1,000 of the deaths: that from diphtheria was not more than 10, yet people were afraid of diphtheria, and were not afraid of measles. The mortality from whooping cough was 23 per 1,000 of the deaths; that from scarlet fever was only 19, yet they could not convince people of the danger of this disease. Some 200,000 infants died every year from the grossest neglect, and yet they allowed this preventable mortality to go on year after year. He agreed that this was probably the most important paper read before the congress. He thought a resolution should go from some quarter of that Congress to the Council of the Sanitary Institute, requesting them to memorialise the Educational Department in the direction of asking them to make hygiene a compulsory part of our Elementary Education System.

THE CHAIRMAN (Mr. Pridgin Teale) said the practical question in connection with instruction in hygiene was that of how it was to be done. That point was touched upon by Dr. Kenwood, and if it was done in the way he had described it was worse than useless. Already teachers were overloaded with work, and if this additional one were thrust upon them what would they do? They would get a book on hygiene, cram a few superficial points, and they would obtain what would be technically called hygiene-teaching, and would be little short of rubbish. It was very difficult to say what should be done. It would require persons of skill and judgment to efficiently impart this instruction in hygiene, and the teaching would have to be from the outside and not from within. If they were to put this before the Education Committee of the Privy Council, they would see these difficulties, and would require some practical method of carrying out such teaching. It was the carrying out that was the difficulty, and not the convincing of people of the desirability of teaching hygiene.

Dr. J. R. KAYE (West Riding County Council, in reply) said he quite agreed with the President in regard to the difficulty of teaching hygiene as a part of elementary education; but where there was a will there was a way, and the lessons of hygiene and social life could be impressed on the mind of the scholar in many ways. Take one illustration—plant life in a flower pot. It would not be difficult for a child in the third standard to follow the description of a plant under favourable and unfavourable conditions and surroundings. To be healthy the plant must have fresh air, sunshine, good soil, and a clean pot, while on the other hand it could be shown that injury followed want of proper drainage from the pot, or by being placed in a darkened part of the room, or crowded amongst others. Thus it was not necessary to seek far for simple lessons as to how to lead a healthy life. With few exceptions hygiene does not find a place in elementary education, and it is only by keeping this anomaly before the public that any hope can be obtained of practical progress.

"*School Hygiene,*" *by* ARTHUR KENT.

ABSTRACT.

THE hygienic conditions of schools, especially Elementary Schools, have hitherto been practically neglected in spite of the obvious necessity for great attention being paid to these places where young children spend so much of their time, and are undoubtedly responsible for the dissemination of so much infectious and other diseases.

There are numerous schools, which can, however, for simplicity be divided in two great groups :—

(1) Elementary, including State or Public controlled Board, and Poor Law. Voluntary controlled by a Management Committee. All of which come directly under the Education Department.

Private Schools and Colleges :—

(2) Large Residential Schools and Colleges.

The schools included in the first group require most attention as they are attended chiefly by young children, and in the case of Board and Elementary Schools, by children of the middle and lower classes, who, of course, know nothing of their hygenic requirements.

The Education Department do to some extent attend to the sanitary condition of schools, yet there are many schools very deficient hygienically and far behind this period of advanced sanitation, a state of things which would probably be easily remedied if left in the hands of sanitary authorities.

The Department still sanction under certain conditions a minimum cubic space of 80 feet per child calculated on the average attendance, and often the schools are overcrowded much to the detriment of the children's health, and help to the spreading of any infectious and other communicable diseases. It would be better if the Department fixed a minimum cubic space of say 150 feet per scholar, calculated on the number of children on the books, so that in the absence of any scholar there would be an increased space for those present. To check and prevent overcrowding, sanitary authorities should have power to visit schools at any time during school hours to count the number of scholars present, and any offence discovered reported to the school inspector, such offence being punishable by a reduction in the grant.

Warming and ventilation although very important are very defective and deficient in some schools. The method of warming by hot water or steam pipes fixed in channels below the floor and covered with open gratings, is very insanitary and

ought to be abolished. The heat from them is unequally distributed, and dust, foul matter from boots, and other filth accumulates. In some schools, the only means of warming is by common iron stoves, and generally in these instances there is also a lack of ventilation, the atmosphere of the rooms quickly becoming unbearable. Very few schools provide for the warming of incoming fresh air. At most schools there are fixed times for commencing and discontinuing warming, and often adhered to however inclement the weather may be, much to the discomfort of the teachers and scholars. All schools should be provided with some apparatus to warm at least a portion of the incoming air. A George's "Calorigen," or Bond's "Euthermic" gas stove fixed in each room, would be an effective method and could easily be put in use on chilly or wet summer days. In schools where gas was not procurable an oil stove on the principal of either of these could be used.

Fire-grates, whether ventilating or otherwise, ought, on account of the dirt and dust they create, to be abolished from schools. All methods for ventilating and warming schools should be constructed to prevent as much as possible the introduction of dust. The great features of good ventilation of schools are provision of appliances which are easily worked. Swing windows often fall into disuse, especially on windy, cold, or wet days. New schools should be provided with outlets in the walls connected by shafts to the basement, where there should be a paddle-wheel shaped fan driven by steam, electricity, or gas engine, to extract the foul air and expel it through an upright shaft or tower above the building. In existing schools where there are no mechanical means for extraction of foul air, small fans or Blackman air propellers should be fixed in the walls, and driven by electricity, the electric dynamo being worked by a small gas or oil engine.

With regard to the sanitary conveniences it is deplorable that whilst the Department insist on having good accommodation in new schools, they overlook the existence of the many midden closets and Rochdale pails not only in rural districts but in the older voluntary and Board schools in thickly populated places where there are good systems of sewerage and abundant water-supply. It would be a big step towards better school sanitation if water-closets were insisted upon in all schools where possible, and in the others, earth or ash closets. Very few schools possess good urinals, those in use being badly constructed and of easily fouled material. They should be constructed of glazed fireclay with a half-round fireclay channel from end to end, and should be provided with flushing apparatus.

The schools should be cleaned oftener than done at present, which is generally only twice yearly, and the walls ought to be glazed tiled to about 6 feet high, and the remainder painted and varnished to permit them to be cleaned easily.

Cloak-rooms should be entirely outside the school-rooms and thoroughly ventilated, and warmed sufficiently to dry any wet clothing.

With respect to school furniture, many schools still possess the old style of desks which are all the same height, and in spite of all that has been said about eye and spinal diseases they are still permitted to use them.

There should be swimming baths in connection with all elementary schools not only for the purpose of teaching swimming, but to promote cleanliness amongst the school children.

Private schools and colleges ought to be registered, and the number of scholars regulated according to the capacity of the school.

A Medical Officer of Schools should be appointed in every town, preferably the Medical Officer of Health, who should periodically inspect the schools, analyze the air to ensure that the ventilation is good, and all older schools deficient in sanitation should be condemned till satisfactory to the sanitary authorities.

Dr. ASTON (Eccleshill) reminded the meeting that better than two years ago, at the Hull Congress, he read a paper on the subject of School Hygiene, and formulated a resolution, which was carried, and urged that all plans for schools should be approved by the Health Officer and Sanitary Inspector before being submitted to the Department, and that the Health Officer should be required to certify annually for every Board School in his area.

Dr. VACHER (Birkenhead) pointed out that though there had been a congress at Hull it was not a congress of that Institute. He moved a vote of thanks to the President of the Section, and spoke of the dignity, fairness, and courtesy with which he had discharged his duties, and also of the full knowledge he had displayed of the subjects discussed. As to the difficulty of imparting instruction in hygiene, he ventured to suggest that a certain book, of which they all had knowledge, entitled "Dangers to Health," should be generally used as a school book. Inasmuch as children and adults also were more interested by what the eye sees in pictorial form than by what they were merely taught by word of mouth, he was quite certain that if that book were introduced into every school no scholar would leave it without a fairly adequate knowledge of elementary hygiene.

Professor TREVELYAN put the resolution, which was carried by acclamation, and with the President's reply the proceedings of the section terminated.

CONGRESS AT LEEDS.

SECTION II.

ENGINEERING AND ARCHITECTURE.

PAPERS AND DISCUSSIONS.

"*Fever Hospital Construction*," *by* EDWIN T. HALL, Fellow and Past Member of Council, R.I.B.A.

(FELLOW.)

IN submitting for your consideration to-day a paper on the Construction of Hospitals for Infectious Diseases I hardly need, before such an audience, impress on you the advantages of the segregation of persons afflicted with these diseases. The remembrance of the ravages caused in our midst by epidemics of small-pox, scarlet fever, diphtheria, &c., is too fresh and too painful to have been obliterated from the mind even in these days, when events crowd so rapidly one upon the other as to render the present and immediate future all engrossing.

The organized attack on these enemies — enemies more dangerous, because less tangible, than the armed forces of hostile nations —is, however, the outcome of the latter half of the Victorian era.

Even in that densely peopled province, the County of London, no hospital specially set apart for scarlet fever existed until 1849, when the London Fever Hospital was opened as an Institution supported by voluntary contributions. Fifteen years later wards for enteric fever were added, and 150 beds for both diseases were the sole provision in London for the reception and treatment of these diseases.

In 1867, however, a great stride was made under the Metropolitan Poor Law Act, of that year. All the Metropolitan parishes and unions were combined into one district, called the Metropolitan Asylums District, for the purposes of providing hospitals and asylums "for the reception and relief of poor persons infected with, or suffering from, fever or the disease of small-pox, or who may be insane."

With the last-named class we have nothing to do in the consideration of our present subject.

It is sufficient to say that the Board constituted to carry into effect the object aimed at by the new combination, soon had their hands full. In 1871—2, a great epidemic of small-pox occurred in London, and during that epidemic the Board admitted to their hospitals 16,089 patients.

As the years go by the public have shown an increasing appreciation of the benefits derivable from the isolation of the infectious sick and from hospital treatment. The number of persons admitted to the London Fever Hospitals increased from 2,197 in 1886, to 22,273 in 1896. Previous to the year 1887 it is estimated that the proportion of admissions of scarlet fever cases (to take this disease as an illustration), to the total number of cases which occurred in London did not much exceed 10 per cent. In 1890 it had risen to 42·6 per cent., and has since then increased to 62·65 in 1896. The first half of the present year shows a still further increase to 71·64; indeed, during May and June the percentage rose to 73·01, and for one week in May it was as high as 85·04 per cent. It would be interesting to note what has resulted since the isolation of fever patients in London, and quoting from statistics prepared by the Metropolitan Asylums Board in July of this year, we find that in 1871 the death-rate from scarlet fever per thousand of population in London was 0·58, whereas in 1896 it was but 0·21, or a decrease of nearly two-thirds.

Incidentally, I may remark that the deaths from typhus and small-pox are shown to have been practically nil in 1896.

Diphtheria cases were not admitted to the Board's hospital until the end of 1888, and whereas the death rate in the hospitals in 1889 was 40·74 per cent., it went down every year until in 1896 it was but 21·20.

In the country, generally, local authorities first derived their power to provide hospitals for infectious diseases, under the Sanitary Act of 1866. A few years later, in 1875, the Public Health Act increased those powers, but very slow was the recognition of the desirability of using those powers, the recognition of the duty of organised communities to improve the public health by removing sources of contamination from the midst of the people.

In 1888 the Local Government Board issued a memorandum "on the provision of Isolation Hospital Accommodation by Local Authorities," and in very simple language set forth the wise doctrine that to make isolation hospitals of any avail their construction should not be put off until an epidemic had invaded a district, but should be undertaken so that the hospital should be in readiness beforehand. Once recognise that infectious disease is an enemy that can be overcome, and the elementary truth set forth by the memorandum must carry conviction with it. Were an invading army approaching would any General wait until it had established itself in the territories committed to his defence before he erected his fortresses? Would he not prepare these in advance? Accompanying the memorandum were a series of most useful and suggestive plans for small hospitals suitable for villages and small towns. They illustrate all the essential principles of hospital planning.

1. The thorough isolation of infected buildings.
2. The provision of cross currents of air to thoroughly ventilate a building.
3. The avoidance of a dark corner anywhere.
4. The necessity for keeping receptacles for excrement as far as possible from direct contact with wards.

No matter what is to be the size of the hospital these principles should govern its design.

When public infectious hospitals were first constructed in England, it was common to devote a part of the site to small-pox, and another part to all other infectious diseases, one set of staff quarters being common to both. It was, however, found that the danger from small-pox was great, not only to the sick patients in other parts of the hospital, but to the surrounding district, and separate hospitals were instituted for small-pox. This resulted in great measure from an inquiry instituted by the Local Government Board in 1881, when the Commissioner reported that "an almost constant ratio is observed between the amount of the hospital operations and the degree of the excess of small-pox in the Neighbourhood."

In London the Metropolitan Asylums Board, in 1885, came to the momentous conclusion to abandon land hospitals for small-pox and to establish floating hospitals in the River Thames at Darenth. The happy result followed that under God's providence the disease has been practically exterminated in the Metropolis. The means by which this result has been obtained demand a few minutes' careful consideration. First the value of isolation is shewn in a remarkable degree; the ships are thoroughly isolated, more so than if they were surrounded by open spaces of land. The fast travelling tide of the river is constantly moving, causing, by friction, movement in the air even in the calmest days; heavy gases are taken away by it and are oxygenized; pure air is always flowing through the wards. Secondly, the perfection of the Board's ambulance service has greatly contributed to the result. No sooner is a case reported as existing than it is conveyed by the ambulance carriage to the tender and away to the hospital. The disease is not given time to spread in the houses of the people. In any scheme of hospital construction for a town of any size too much stress cannot be laid on the necessity for an ambulance station, and an organized ambulance service.

On the question of the maximum size of an infectious disease hospital I have not been able to find any data to prove that any limit need be set. Given an adequate area of land and an adequate staff a hospital may be of any size. With the question of area I will deal directly. With that of staff it may be said that the maximum is fixed by the number of patients which one Medical Superintendent can well supervise. That is merely a matter of organization. For the sake of argument we will assume that to be 500. It would be quite practicable from the administrative point of view to combine 2, 3 or 4 of these units with a Medical Director General over all, just as several regiments of soldiers are combined under a superior command. I do not say this is desirable or practicable as a general rule but I use it as an illustration of the question we are considering.

In London the largest hospital for acute cases provides for 548 patients under one Medical Superintendent with 5 assistants, and I believe the Local Government Board consider that about the maximum. As a fact however the planning of the hospital must largely affect the question. If the plan of the wards be a straggling one in relation to the administrative buildings then 500 may be too many. If it be compact in the sense of grouping the wards in convenient relation to the administration then more than 500 may be none too many.

As to the provision of beds necessary for any given town, Dr. (now Sir Richard) Thorne Thorne, the Medical Officer of the Local Government Board, referred in 1891 to an estimate that a provision of one bed per thousand inhabitants was sufficient, but wisely remarked that that depended on the character and size of the houses in the Town, pointing out that less accommodation was required in a well-to-do district than in a manufacturing or colliery district.

In London, the total accommodation for acute Fever and Diphtheria, when buildings now in progress are completed, will be 4,642, or say one in about 1,000. This amount however, does not include provision for 1,380 Convalescent patients which brings the total up to 6,022, or say about one bed per 775 or 800 of population.

I have not included small-pox cases in these figures at all.

When a Local Authority has decided on the number of beds required to be provided, the question of site will have to be considered.

This should be in as open a position as possible. If one could be found surrounded by roads it would be better, because all roads are channels for wind currents.

It should be on elevated ground so that drainage may be readily carried away. A site standing high with but a gentle slope is best and most economical. Avoid one with steep slopes. Get a site with good trees, at all events near the boundaries, and keep every tree that you can, both for the patients' health and enjoyment and for the sake of the locality. Let the hospital grounds be as like a park as you can. A compact site is better than an elongated one.

Much has been said and written as to the maximum number of patients per acre that should be put on the site. I am not aware of any data that justify any one of the arbitrary figures suggested. At Glasgow the Belvedere Hospital has 17 beds per acre, at Liverpool the Grafton Street Hospital has 34. In London the Eastern has 40, the Western 36, the South Western 47, the South Eastern 42, the North Eastern 22, the Fountain Temporary 40, the Brook 16, the Park 28, the Grove 19.

Enquiry, however, does not shew that the higher numbers give worse results than the lower, and if there were anything in the theory, there should be some differences. The method of computation is also unsatisfactory, because in some cases the buildings are all grouped close together, and there is a large piece of the calculated area unbuilt on, and having no more to do with the number of beds per acre than has the adjacent land which does not belong to the hospital. Of course there are limits, and I know of one case where the number is much greater than any I have quoted. In that case, when the beds are all full, the cases take longer in recovery than when there are fewer patients.

What then should determine the area required? First, the relative elevation of the site and its isolation. In short, the facilities which naturally exist for a rapid change of the surrounding atmosphere. Next the necessity for an unoccupied zone between infected buildings, and the boundaries. The Local Government Board fix a minimum of 40 ft. The Asylums Board in all their recent hospitals fix "about 100 ft.," a much better zone for many reasons, and especially for large hospitals.

Then we come to the separation of buildings. The Local Government Board fix this at a minimum of 40 ft. between any infected building and any other building whether infected or non-infected. The Asylums Board, however, have fixed as between parallel two-storied infected buildings a distance equal to twice the height of the building. For a one-storied infected building 40 ft. is a minimum, and it is better to make this 60 ft. for other reasons.

A 40-ft. distance between the ends of infected buildings axially in a right line is adequate, but again a greater distance is better.

If a site be laid out to give the isolation here described, the number of beds per acre will take care of itself.

Again, it is eminently desirable to have all pavilions axially about north and south. It will readily be seen that in this way every internal wall of the large wards will receive the sun at some time of the day.

It must be determined whether to have one or two-storied pavilions. The former are better, but they are somewhat more costly. Two-storied wards necessitate staircases and lifts for trollies of coal, food, &c., but the patients are nearer to the administrative centre, and the distances to be traversed are reduced by one-half. Medically the ideal is doubtless the one-storied hospital, but the practical suggests and permits of the two-storied.

We will assume the size of the hospital and the area of the land to be decided, due allowance being made for staff buildings, laundries, &c. We will now consider—

The Block Plan.—There should be two entrances only to the hospital. One for all the staff, patients and stores; one for the hearse, coffins, &c., the last being so placed that it is out of sight of the patients. The main entrance should be wide and hospitable in appearance, and may be by two pairs of gates with a hand-gate at the side. Close to this on the one side should be the porter's lodge, and near it the offices for the committee of management, the medical superintendent, and the chaplain. On the other side may be the waiting rooms for visitors to patients, and near by the discharge rooms for patients with bath and dressing-rooms. If a large hospital be in contemplation and it is desired to have a married medical superintendent his residence should be near at hand, and at least 100 ft. from the infected buildings, and in that case a private entrance from the road for the family is desirable. If an unmarried superintendent be required his quarters may be part of a larger block containing the staff.

The shape of the site and the size of the hospital will determine the position of the kitchen, steward's stores, and similar administrative buildings. A good road should run all round the hospital within the zone. I have thought it would assist the meeting if I exhibited drawings (1) of the Grove Hospital, London, which the Architect, Mr. Tiltman, has kindly lent me for the purpose. This is not yet completed. It has accommodation for about 520 patients; (2) of the Park Hospital designed by me, which is the largest hospital for acute cases of fever and diphtheria in the United Kingdom, providing as it does for 548 patients; (3) my design for the Plaistow Hospital, providing for 179 patients.

In regard to the size of the Park Hospital it may be of interest to note that it contains forty-two buildings, has six miles of drains within the curtilage, twenty-nine miles of water and steam pipes, and forty-two miles of electric wires. The Plaistow Hospital is on a small site, and consists of 20 buildings.

In a large hospital it is wise to put the administrative buildings such as kitchen, stores, dispensary, water-tower, telephone exchange, &c., in the centre of the front, and in the Park Hospital it will be noted they are about equi-distant from the extreme points to be served throughout the hospital. In this institution the servants are in separate houses close to the kitchens, &c., with a cheerful outlook towards the roads. The Steward and the Assistant Medical Officers have separate residences also centrally placed, that of the Assistant Medical Officer being close to the diphtheria pavilions, an important point.

To the east are the diphtheria and enteric pavilions, to the west the scarlet fever pavilions, to the south and south-west the isolation pavilions, to the extreme south the nurses' home, a residence of 200 rooms, and to the south-east the laundries, workshops, disinfector, &c. The nurses should be so placed that they can have gardens or recreation grounds to which they may retire out of sight of their work.

The admission blocks to the various diseases are at the zone or outer ends.

In the Plaistow Hospital, owing to the limited site and the necessity for the forty feet zone around infected buildings, the plan is quite different, except as to offices and discharge rooms. The scarlet fever pavilions are to the left after entering the gates, with their separate admission block. In the centre opposite the gates is the isolation pavilion. To the right on entering is the admission room for diphtheria, &c., with pavilions behind.

The administrative buildings are all on the one side of the site, and the Home at the angle of the two roads.

As the ground available for recreation is very restricted I have made flat roofs over the two wings, one for the servants and one for the nurses. Here they enjoy fresh air and good views. In the Home there are separate flats for the Medical Superintendent, the Matron, and their immediate subordinates. The female servants' rooms are grouped in the one wing, the sisters', nurses', and superior servants' in the other wing and the centre.

The Kitchen is close by with easy service to the nurses' and servants' dining rooms, while the access to the hospital wards is by means of covered ways. The steward's stores are close by with a separate unloading yard. The laundry is more to the east, with incinerator and disinfector. The last-named is intended to be used not only for the hospital but for the locality, hence it is accessible from the yard containing the ambulance stables and the mortuary. This yard opens into a road, and it will be seen the mortuary is quite out of view of the patients.

Much has been said for and against covered ways connecting all wards with the administrative buildings. I am decidedly in favour of them, certainly in a large hospital. In such an institution it is more economical to have a centre or two from which can be supplied (1) steam, by which, in preference to coal, all the hot water required for heating the wards and for services to sinks and baths should be heated; (2) electricity for lighting, for telephones, and fire alarms; (3) water for cisterns supplying sinks and baths, fire mains, &c.

The various mains and cables to convey these fluids should be carried in subways (well lighted and ventilated), by means of which they are protected from weather, and are accessible at all parts for repair.

The roof of these subways forms at once the platform for a covered way, and the roofs of the covered ways, raised near the pavilions, are invaluable as balconies for the first-floor wards. On to these balconies patients' beds can be wheeled for sun baths, the curative value of which is admitted by all doctors.

Covered ways should be constructed of as durable materials as the other buildings. The cost of maintenance is thereby reduced to a minimum.

It is said that hospitals of detached buildings having no covered ways between them are approved by the staff, but it must be better for all to have a dry and solid pathway to walk on, than a soft footway covered with snow and sludge in winter or deluged by the rain storms of the summer.

The covered ways should be 8 to 10 ft. wide, and at least 8 ft. high open at the sides, but protected by a balustrade say 4 ft. high. kept 6″ from the floor. It is said that the open side does not keep out the weather. True, neither does an umbrella, but except on very rare occasions both afford great protection. Ordinary rain from thunder-storms comes down, if not vertically at a small angle from the vertical, and a cover 8 or 10 ft. wide would be an efficient protection from $\frac{11}{12}$th of our storms of rain, snow or sleet.

Doctors, nurses, servants, food, fuel and all stores constantly pass from one part to another of a hospital, and need all the protection that can be given to them, and when to this is added the value of subways and Sun-balconies, I venture to think the case is complete.

The staircases to the upper floors should open out of, and be part of the covered ways, and should not be inside the pavilion.

Having given an indication of the block plan, we come to—

Details of the Main Buildings.—Let us take one pavilion as an example. This should be constructed of brick or stone.

Its floors should be of fire resisting construction. The lower floor should be kept about 5 feet above the ground level, and built on open arches so that the open basement may be readily accessible.

Ward floors should be covered with some hard material impervious to germs. Terrazzo is used occasionally. I only know of one hospital in England, the Derbyshire Infirmary, so floored, but abroad its use is more common, and occasionally these floors have been heated from beneath. The objections to it are multitudinous joints, and it is hard and unsympathetic to the feet.

I have hardly seen any terrazzo floor of large area which has not defined cracks, of course filled with cement, arising from the swelling and subsequent shrinkage of the cement used in laying.

In England, as a rule, wood floors are used, and I recommend teak in long narrow boards laid in bitumen and edge-nailed directly to the concrete. Never have spaces between the floor boards and the concrete. This floor wax-polished is hard, warm and impervious. Avoid parquet floors with innumerable joints.

A factor first to be considered in planning is how many patients should be put in a pavilion? In cases of scarlet fever it is I believe considered by the medical men most economical from the nursing point of view to have not less than 14 in a ward. After a very careful enquiry The Asylums Board fixed 20. We may well accept that as a good rule for a large hospital, and in that case a pavilion should have only one large ward on one floor.

There are however towns where a smaller number may be more suitable in one ward, and where two smaller wards of equal size may be joined on one floor under one pavilion roof. I am not now speaking of wards for only 6 patients each but of those for 12 or 14. Of these double ward pavilions there are three types. One where each large ward designed for separate sexes has a common hall of entrance with a central nurses' room commanding views of both wards, as at Liverpool, another where both wards are for the same sex, one for acute and one for convalescent cases, as at Salford, and a third where there is so to speak a party wall between the two large wards with separate nursing staff for each, as at Glasgow, and with or without a separate convalescent ward to each large ward. In diphtheria and enteric cases the Metropolitan Asylums Board limit the large ward to 12 beds, as the individual cases require more personal attention by the nurses.

The best height for a ward from a practical point of view is 13 feet in the clear. Any greater height is not aerially of any value to the patient, and any less height in a large ward looks oppressive. For scarlet fever 2,000 cubic feet per patient are required and 12 feet of lineal wall space per bed. This suggests 13 feet as half the width of a ward or 26 feet for the double row of beds.

For diphtheria 2,500 feet is required per bed, and taking the height and width as last described it follows that a wall length of 15 feet is necessary. A less width than 26 feet is certainly not desirable. There are hospitals with much greater widths and old ones with less, but 26 feet appears to be a happy mean.

A small separation ward, say for one or two beds, should be placed on the same floor as the large ward, for patients who for any cause require to be separated from those in the general ward, and here, perhaps, it will be opportune to consider the nursing of sick members of the staff. There are advocates for and against having a separate infirmary for the staff. On the one hand it is suggested that a sick nurse loses "caste" and authority if she is placed in a general ward with the patients; on the other hand it is contended that it brings the wards into disrepute if sick nurses are treated elsewhere, as a feeling is created among patients and their friends that in the infirmary some superior treatment is given to the staff.

There is a third argument not used by either side in the dispute which is of more importance than all the others, and that is a tendency to devote so much attention to patients proper that members of the staff are liable to be neglected. To meet the legitimate arguments of all parties, I suggested in the Park Hospital the abandonment of the staff infirmary and the addition of a single bed separation ward (in addition to one or two beds specified) on each floor of a pavilion. This single bed ward to be used for any sick member of the staff when required, but otherwise to be available for any patient. By this means the staff patient receives exactly the same care and treatment as an outside patient. I am happy to think the compromise met with general acceptance. The separation wards should be calculated at the higher rate of 2,500 cubic feet per bed.

A nurse's duty room as distinct from the ward kitchen is not necessary except in cases where there is a sister in charge of a pavilion. A nurse's place when on duty is in the wards, when off duty better accommodation and recreation for her is provided in the nurses' home.

A ward kitchen or serving room is essential. It should be fitted with a hot closet or small kitchener. Bear in mind that the food generally is cooked in the hospital kitchen. A sink with hot and cold water, a dresser, and table are also required. Attached or adjacent should be a small larder for cooked meats, to contain refrigerator, &c.

It is desirable to have all the china and crockery of one floor kept in the ward kitchen and washed-up there. This arrangement renders each ward maid responsible for the service of her own ward.

The kitchen should have an observation window commanding the large and separation wards.

All ward doors should have clear glass panels, in fact everything for observation, nothing for secrecy.

A linen room is necessary to contain all that is required for the one floor, and this should open out of the corridor.

Ward Accessories.—The sanitary accessories are of the greatest importance. The W.C.'s for patients, slop and scalding sinks, &c., should be conveniently-placed in a detached tower connected by an enclosed passage, or enclosed bridge to the main ward. I prefer the bridge, it is open to the air all round. Two water closets should be provided, one for adults and one for children.

A similar tower to contain bath room with 2 baths is necessary. Some doctors desire to have sitz or other baths in addition to the long bath. In both towers, if possible, it is desirable to have lavatories. The position of these sanitary annexes is a moot point. Some advocate them at or near the entrance to the pavilion. At Glasgow, one tower containing baths, lavatories and W.C.'s, is separated from the main wards by the general entrance lobby; at the Brook hospital, London, the bath room is at the corridor end of the main ward opening from both, while the W.C.'s are in a separate tower on one side at about the centre of the ward.

In other hospitals, including the Park, the towers for (*a*) W.C.'s, scalding and slop sinks, and (*b*) baths, are separate and are at the extreme end of the large ward, one at each angle, and in considering this position it must be remembered that the admission buildings for all scarlet fever patients contain bath rooms. Between the towers a wide balcony is accessible from the ward. At the entrance end of each pavilion and convenient for the separation wards, or for the near end of the large ward, I have placed in the nurses' lavatory a movable bath and a slop sink, besides a lavatory basin and W.C. for the nurse. It appeared to me that by this arrangement greater convenience could be obtained for bathing patients, and there was no obstruction to the access of the east and western rays of the sun to the ward. It is not, however, possible to dogmatize, as in some cases one arrangement is better adapted to the requirements of the site than the other, as, for example, in the Plaistow Hospital, where the site does not admit of end towers.

Heating and Ventilation.—It is of great importance to ensure a uniform temperature to all parts of a pavilion, and I believe the best form of heating is by low pressure hot-water radiators beneath windows. These radiators should be calculated to give a temperature of 65° throughout the building when the external temperature is at 28°. The coils should be enclosed in iron cases with hit and miss covers. At the back, external inlets should be provided for cold air to enter at a velocity of say 2½ ft. per second in sufficient volume to change the air of a ward three times in the hour. The inlets should have means to control the rush of air to suit variable winds. The wall apertures should be made smooth.

I deprecate horizontal pipes around the walls of a ward. Those in trenches are not to be tolerated at all. It is far better to put all horizontal pipes in the open basement beneath the pavilion, protecting them by non-conducting material such as asbestos cement. They are then accessible at every part, and from them vertical pipes should supply the radiators.

There should in addition be central fire-places, say one fire for every 30 ft. of length in a ward. These open fires give cheerfulness to the room, and are most valuable extractors of foul gases.

In my judgment, a central stack is much better for an infectious ward than a stove with horizontal flues carried to the external walls. These flues, when not in use, are harbours for germs, difficult to clean, and require manholes in the ward floors. In upper floors the horizontal flues if swept externally need ladders, and they necessitate a floor 2 ft. to 2 ft. 6 in. thick. These stoves are also difficult to light except with the aid of gas jets. Exhaust ventilating flues in external walls are cold, and not of great value. In a warmed central stack an upward current is naturally induced.

The stove in the centre used with horizontal flues in the floor has however the advantage, appreciated by many, of allowing the ward to be seen at a glance. Whether that advantage in a ward 120 ft. long is a set off to the many objections to which attention is drawn, I will leave others to judge.

I wish to draw attention to a drawing on the walls of a central stack designed by me for the Park Hospital and made by Messrs. Doulton & Co. The external surface in the stack is of glazed faiënce of various colours, forming a sanitary surface. It is made with fire-clay smoke flues all of which start from the open basement from which they can be swept. Each fire-place has its separate smoke flue and round these flues are clustered from each ward four aspirating flues of areas calculated to carry off the lighter gases which ascend to the ceiling of the wards, while the fire-places take off the heavier gases near the floors, both together removing the internal air of the room at the same velocity as that at which fresh air enters the wards.

The stacks themselves with 4 smoke and 8 ventilating flues are but 3ft. 6in. square, with rounded angles. They serve to break the monotony of the open wards and the iridescence of the coloured material is highly decorative.

The surface of the walls of a ward should be of impervious material faced with Parian, Keene's or Robinson's cement painted in various artistic colours to rest and please the eye and varnished. I believe the artistic treatment of a ward has a refining as well as a curative value to patients.

In many wards glazed brick dados are used. They are relatively costly, and the numberless joints are objectionable. These joints are pervious to germs, and in some cases they have been painted to overcome this difficulty. All angles of walls, ceilings, floors, door and window jambs should be concave, square angles being dust and germ harbours.

Windows for all parts of a hospital should extend to the ceiling. They should have transomes with lifting sashes below and fan-lights above hung at the bottom and opening inwards. The cheeks of these fanlights when open should in the wards be protected by glass spandrils in iron frames. Sometimes these are carried to the ceiling, but that I think a mistake, because the space next the ceiling between the windows is not then cleared by air currents.

Sashes should be so made that cords can be renewed without the ordinary necessity of taking out the sash, a most objectionable practice in winter time.

Doors should be provided inside the weight linings for getting at the weights and for sweeping the linings. I believe these linings are objectionable in fever hospitals, and I recently designed a window with solid frames for balanced sashes having no weights at all. The sashes open not only by up and down movement, but fall inwards like the fanlights. By this means the whole area of the frame can be opened for occasionally scouring a ward with fresh air, and the sashes can be cleaned, painted, and reglazed from the inside.

Doors in wards should be prevented from slamming by means of check action floor springs, and all should have solid frames with no spaces behind.

Sinks in hospitals should be of glazed stoneware and have grated washers and plugs with overflows, made accessible for cleaning. All sinks and lavatories should have traps beneath them and the wastes from these should be carried through the wall discharging over gullies.

Slop Sinks.—The design of these is of great importance. Professor McHardie designed a large sink with jets for cleansing bed-pans, &c., but it is costly, has a large surface, and is very deep. Messrs. Dent and Hellyer next designed an admirable sink, with an upward jet for cleansing bed-pans, and a flushing rim. This had two 3-gallon cisterns and pipes, one for the upward jet, one for the rim. A danger to be guarded against is the liability of the paper and soil being driven into the handle of the pan by the rush of water, and if no pan be inserted and the wrong handle pulled the upward jet becomes a fountain three or four feet high.

I have here a drawing of a sink designed by me and made by Messrs. Dent and Hellyer; in this sink, which is small and shallow, one 3-gallon cistern does all the work. The water enters the pan by one pipe with two branches, one to the flushing rim, one to a brass nozzle at the back, designed to enter the handle of the bed-pan. From this nozzle the water spreads like a palm leaf, scours the bed pan and the soil drops at once into the trap. If no pan be used the jet causes no inconvenience, and it scours the sink most thoroughly. The cost of manufacturing this sink is manifestly less than that of any other, it uses little water, it is handy, it has a square table top, and the service pipe remains after use free from water. It is made on Messrs. Dent and Hellyer's bracket principle, standing quite clear of the floor. I think this principle, both for slop sinks and W.C.'s, an excellent one, as the floor being unobstructed can be thoroughly cleansed, and there are no dark corners.

Isolation Pavilions.—In addition to the ordinary pavilions there should be what are technically termed Isolation pavilions. These are for the reception of doubtful cases, *i.e.*, cases of which the diagnosis is not certain. As a rule experience in London has shown that sufficient provision of isolation wards has not been made in the past, and at the Park Hospital this deficiency has been amended by providing six isolation pavilions of ten beds each, or 60 out of a total of 548. In these pavilions, which are two storied, we have two wards of four beds each, and two of one bed each. The sanitary accessories are similar in character to those of larger pavilions.

Airing Courts.—All pavilions should have airing courts attached, enclosed to prevent straying of patients, and paved with asphalte or tar paving. No fever airing court should abut on a diphtheria pavilion, and *vice versa.*

Staff Quarters.—In a large hospital, where there is room, the various classes of the staff should have distinct residences or homes, and no nurse or servant should sleep in a fever pavilion.

Within reason, it is desirable that all should have to walk through the air to the home, so as to get the benefit of thorough aëration as well as exercise. Each nurse should have a separate bedroom with a fireplace. It is usual to give a cubicle to each servant with no fireplace, but instead, hot water warming. I think greater privacy would be secured by forming a separate room for each, retaining the hot water pipes. Nurses' and servants' homes should contain sitting and dining rooms, but the nurses should also have a third room for writing and reading, the "quiet" room.

All homes should be of fire resisting construction throughout, and those containing over fifty inmates should have at least two staircases at the extremities of the building, providing alternative means of egress in the event of fire. When large numbers are lodged, the Home should be divided into blocks, and if these are connected by glass and iron enclosed bridges—parts made to open—additional means of egress are provided, while fire disconnection is assured, because the glass would break as soon as the flames attacked it.

Attached to each staff dining room should be a service room to receive food from the hospital kitchen. This should, of course, be as near to the exterior as possible.

All homes should be designed with longitudinal and cross ventilation, and all passages should have end windows.

All W.C.'s and bath rooms should be in separate towers like those to infected buildings.

The Hospital Kitchen.—This should be spacious and airy, every part accessible to sight, and all designed for cleanliness. An ample scullery with stores for food in daily use, &c., should be provided.

The Steward's Store is a warehouse fitted for all kinds of furniture, dry goods, liquids, &c.

The Laundry should be designed so that foul linen entering at one end may pass through the various processes of cleansing, drying, finishing, and sorting, passing out at the other end. The fittings require much care and the cumbrous old-fashioned mangle should be excluded. For a large hospital separate laundries for patients and staff are desirable. The incinerator and disinfector should be close at hand.

The Boilers.—I think Lancashire boilers are best suited to the varied requirements of a hospital, and adequate storage for coal should be in close proximity. Careful study should be made of means to check and reduce coal consumption.

Water Supply.—It is important that a hospital should have a copious supply of pure water. Shallow wells should not be used as a source of supply, but deep wells reaching pure water are, of course, admirable, if no public supply is available at a cheaper rate. If the water be too hard a softening apparatus should be fitted up to remove the excessive temporary hardness, or boilers and pipes will soon become useless. If this hardness be reduced to 5° or 6° no harm will come to the boilers or pipes. There should be storage for at least one or two days maximum consumption of the hospital to provide for possible accidents to mains or pumping machinery, and a water tower may be a necessity to give the requisite pressure in fire and other mains.

Drainage.—The drainage of all non-infected buildings should be kept distinct from that of infected buildings, and that of scarlet fever pavilions should be separate from that of diphtheria buildings. All drains should be laid in straight lines with manholes at all angles, and the ventilation scheme should be most carefully studied. Pipes may be of stoneware or cast iron. All pipes if of stoneware should be laid on cement concrete, great care being taken to see that the gradients of trenches are regular and the bottom solid. All soil drains at least should be covered with concrete after the pipes have been tested. No test is so good as filling with water from manhole to manhole, and there should be a head of about 5 feet of water at the upper end. For manholes I have used Border's patent, of solid glazed fireclay, which I think are superior to all others.

Flushing tanks should be placed at the upper extremity of every main drain regulated to periodically flush the drain without undue use of water. Bath wastes should also supply flushing tanks.

Intercommunication.—A telephone system in a large hospital is of great value. There should be one transmitter in every building. In a small hospital this could communicate directly with every other building, but in a large hospital a central exchange would be better.

Fire Alarms.—There should be a fire alarm in every building. This should communicate (1) with the engine-house, to enable the pumping-engines to be set to work for charging the mains or the central tank (2), with the medical superintendent's house (3), with the men servants' home (4), with the porter's lodge. It is as well to have some definite signal for rousing all the staff on great emergencies.

Fire Hydrants should be fitted throughout, the hose attached and in cradles with nozzles fitted ready for actual use. Buckets regularly filled with water are of great value.

If there is anything else to be said as to detail, I would recommend as the motto for the inside of an infectious hospital, "Let nothing be hidden." All water and gas pipes should be not only visible but kept away from walls and ceilings so that all may be kept clean; all electric casings should be on the surface.

Avoid harbours for dirt and vermin. All coal bunkers should be of galvanized iron capable of ready removal. They should have rounded angles at the sides and next the bottom. One at least should be provided to every building and none should be very large.

Adequate storage should be provided for coal and coke in bulk to provide against a famine arising from strikes, frost, etc. Moveable receptacles should be provided for dust and refuse. All cistern rooms should be well lighted and ventilated, and all cisterns should have wooden covers lined with felt. All outlets should be at the sides for ready access. Galvanized iron water-pipes are preferable to lead.

My paper would be incomplete without referring you to the admirable books on hospital construction by Sir Douglas Galton, to the monumental work of Sir Henry Burdett, and to the published reports of the Metropolitan Asylums Board, whose experience is necessarily greater than that of any other public body in England.

Last, but by no means least, I would venture to urge on all local authorities the desirability of making their hospitals architectural in treatment. No greater or better evidence of the advance of civilization and culture among peoples is observed throughout the world than in the character of their public buildings. Giant strides in domestic architecture have been made in England during the latter half of this century. Foreign critics have noted and praised this great advance, and surely when the people are building for themselves large public Institutions, they will desire that these should be worthy of the nation. Edinburgh has a world-wide reputation for her public buildings, but too many of our towns and cities are sadly lacking in architectural monuments. Public bodies demand and rightly demand that everything shall be provided in our hospitals that science can suggest for ameliorating suffering and curing the body. It is but a step upward and onward to demand that the exterior of the buildings should be graced with artistic treatment to educate and refine the mind, and I venture to think no ratepayer would grudge the small extra outlay necessary to this desirable end.

Mr. **James Blackham** (Warwickshire County Council) said he should like to ask Mr. Hall a question with regard to his remarks as to the beautifying of palatious and infectious hospitals, which meant a great expenditure of public money. As a practical man, would Mr. Hall tell him if he was right in saying that, after a time, infectious diseases hospitals become themselves infective; and if it was necessary to remove and replace these buildings from time to time. He should also like to ask whether, under these circumstances, it was advisable in the interests of the ratepayers to make these buildings permanent and artistic. Mr. Blackham's opinion was that such hospital buildings should be light and cheap and built every 50 years, the cheapest and best way would be to burn down the infected buildings and rebuild.

Councillor **Stanley Udale** (Lincoln) said they had had a very exhaustive and somewhat minute account of a very expensive building, suitable for a town of the size of Leeds or London. But it must be borne in mind that the majority of persons in that Section were representatives of smaller places. He represented a town of 50,000 inhabitants, and they were now engaged in considering plans for building an infectious diseases hospital. They could not, of course, go in for an elaborate scheme, such as this Park Hospital, of which particulars had been given, and he should like some information with regard to a more reasonable scheme for some of the smaller towns. He should like to know whether any information could be given as to what the establishment charges, speaking generally, would be for a hospital suitable for a town of 50,000 inhabitants. This was a very important point, because these hospitals are expensive matters; eminently desirable, but, as our friend said, we represent the citizens and must have some regard to the question of cost. Before embarking on a scheme of this sort we have to consider the annual establishment charges, and to know how much in the £ they would mulct the ratepayers.

Major **G. K. Scott Moncrieff**, R.E., (representing the War Department) said he desired to refer to one or two matters of detail in the interesting paper they had listened to; more especially in view of the experience gained in Military life during the last few years, in the construction of large Military Hospitals. The War Office had received much assistance from their brothers in civil life in these matters, and their military experiences might, on the other hand, be of some assistance and value in considering this question. With regard to having the lower floor in a hospital raised five feet above the ground level, with air spaces underneath, they had tried that in one or two places, but found that the hollow spaces were refuges for dirt and dust of various kinds, which, of course, it was their very object to try and avoid. There should be a basement underneath, the floors above being raised to a sufficient height to enable men to examine the basement. This had been found preferable to the open space which had been referred to. With regard to warming; at the Curragh they had used stoves with horizontal flues, but they found them continually a source of annoyance. At first they appeared a very desirable arrangement, but they afterwards found it very much better to take the smoke up a central stack as the writer of the paper suggested. When the hospital at Aldershot was subsequently built, the arrangement which Mr. Hall had described had been used and found extremely successful, while it also added materially to the cheerfulness and appearance of the ward. On the question of the separate drainage of hospitals, the principle seemed a desirable one, but as far as his experience went, it was somewhat difficult always to carry it out. It might be kept in mind as an axiom to be followed, if possible; but if a hard and fast rule was made, it would be very hard to keep. With regard to surrounding fences, he quite agreed that they should be such as not to cut off entirely the people inside from the people outside.

Dr. H. Cooper Pattin (Medical Officer of Health, Norwich), as one entrusted with the management of a fever hospital, said he wished to express his interest in the paper, and also his deep regret that he had not under his control a similarly magnificent establishment. But with a hospital which only provided less than half the number of beds that were necessary, he had naturally to put up with many disadvantages. The points he specially wanted to draw attention to were these. The hospital he referred to had been already constructed before it came under his control, on plans approved by the Local Government Board at innumerable stages. The greater number of the principles laid down by Mr. Hall were entirely disregarded. The designers and architects, he did not add the builders, put into the building as many unnecessary cracks and crannies as they could. He had done what he could to make the best use of the material at his disposal, and, on comparing results, he found he had not done badly. He found the most serious nuisance and inconvenience was the provision of horizontal stoves. With the wind in some directions one block was uninhabitable, owing to these stoves smoking. They had tried various devices, but were simply smothered with smoke, and existence made practically intolerable. He had been for four years urging his sanitary authority to enlarge the hospital, but unsuccessfully. With regard to the excrement of hospital patients, both typhoid excrement and that of scarlet fever must be burned before being discharged into the sewers, or sterilised with steam. In building fever hospitals, he thought they must try and make the home surroundings of the nurses agreeable and pleasant, or the nurses would not stay with them. They would go away as even his probationers often did. Nurses were removed from the ordinary enjoyments of women of other occupations, and Sanitary Authorities should be exceptionally generous and liberal to them. He had tried to get his committee to provide the nurses with cycles, but they would not. However, he had got them a piano. They also wanted to make an adequate provision of books, as libraries naturally did not care to lend their books on account of the risk of infection. He had had practical experience of some of the difficulties that had to be met with. There were the gentlemen of the Local Government Board. They had insisted, when his hospital was constructed, on a system of ventilation, and he should like them to pass one night in the beds in which patients were to be treated with their system allowed to work. If they did not get stiff necks and enlarged glands from the utterly unscientific ventilation they had insisted upon, he should be very much surprised. It was little less than cruelty to insist upon patients being forced to sleep with open windows on either side of them, so that the air came down upon them like a cold stream of water, to give them, in his experience, glandular enlargements, instead of having air streaming up from below.

MR. C. MASON (London) asked what was the cost per bed of the Park Hospital. It would also be of great value to them to know the cost per bed of a similar hospital on a smaller scale.

MR. HERBERT NIELD (Middlesex County Council) asked what the cost per bed of the Park Hospital was, as contrasted with a bed in the North Eastern Hospital, which was also under the Metropolitan Asylums Board, and also as compared with a bed in a general hospital, such as Leeds. He asked the questions because the Metropolitan Asylums Board were not answerable directly to the ratepayers, but were a curiously constituted body, whose expenditure sometimes appeared to support even charges of extravagance over which ratepayers had little or no control.

Capt. C. W. ANDREWS (London) replied to the last two questions. He said the Park Hospital was really the outcome of a large amount of consideration and deliberation, and of a large amount of information, which the Asylums Board gathered from the provincial towns. Four years ago the Board sent a deputation of four or five to Manchester, Glasgow, Edinburgh, and other Cities that had excellent hospitals, to see anything and everything they could which might be of advantage to the new hospital they were about to build, having had an interview with the members of the Local Government Board, when the area requisite for each patient was fought out and contested. It was a mistake to suppose that the members of the Asylums Board were not accessible. They were elected, or two-thirds of them were, by the guardians. They were answerable to them, and were continually called over the coals if there was any expenditure of which they did not approve. The deputation reported to the Board what the Special Committee of the Board had determined as to the size of the hospital. They then applied to the Chairman of the Royal Institute of British Architects to recommend several names to guide them in drawing up a scheme to submit to public competition. He advertised, and a number of Architects competed to give them the accommodation they required, in the best and most efficient manner at the lowest possible cost. They were instructed to spend no money unnecessarily in architectural decoration. The plans were exhibited at the Imperial Institute, and the judge went closely and carefully through them and made his awards. Mr. Hall was one of the successful candidates, and

Mr. Chiltenham was another. They had done their very best to produce a building that would be most thoroughly adapted for the patients; and at the same time studied economy and efficiency. The comfort of the officials and the nurses was studied more than anything else. He would guarantee that Nottingham had one of the grandest hospitals ever seen, yet he believed the Park accommodation was somewhat superior. They had nurses' dining-rooms and drawing-rooms, and every effort had been made to make them as comfortable as if they were away from the place. They had made every endeavour to produce the best possible hospital for the purposes which it was required. Neither of their hospitals were yet completed, and they were not quite ready to receive patients. The accounts of the Brook Hospital were not yet made up, and with regard to Park Hospital, possibly Mr. Hall would give the figures.

Mr. **John Hall** (Mayor of Cowbridge) also referred to the question of cost. He desired to emphasize what their medical friend (Dr. Cooper Pattin) had said. He had struck the right point with reference to the disposal of sewage. There was not the slightest doubt that his idea was the correct one. He was rather surprised that in an establishment like the Park Hospital their sewage went into the public sewers. That was a very serious blemish in the scheme. He said that, with all due deference to his superiors and in his humble opinion, this was a point deserving of very serious consideration. Were any cases of small-pox treated in this hospital? He asked the question because it was a matter he had on his hands now.

Mr. **Hall**: All small-pox cases in London are treated in ships on the Thames.

Dr. **J. Mitchell Wilson** (Doncaster), desired to say a word with reference to the danger of mixing hospital drainage with the ordinary drainage of a town. He had had the oversight of four small hospitals in which cases of infectious disease are treated, and had carefully watched their effects on the neighbourhood, where the sewage mixed with the public sewage of the town. He was compelled honestly to say that there was no evidence whatever of any infection having gone beyond the sewers to any persons living in the neighbourhood of the hospital. On the absence of evidence to the contrary it ought not to be thrown upon sanitary authorities to provide separate means of drainage for hospitals. No such evidence, so far as he had ever heard, had been forthcoming, nor had his experience gone to prove it. The whole question was one that weighed so heavily upon Sanitary Authorities that they ought not to throw upon them any heavier responsibilities than they could justify. The statement had been made that nothing less than burning the excrement would be satisfactory. With that statement he ventured to differ entirely. He hoped the reader of the paper would express his views upon the matter.

THE PRESIDENT of the Section (Mr. Lewis Angell) said with regard to the applicability of that class of hospital to smaller districts, the details would be generally the same for a small hospital as in the one Mr. Hall had described. He wished to point out that representatives of the ratepayers did not spend money for the sake of spending money. It was an old cry to avoid taxation, but they ought to view the cost of a hospital as a cheap insurance, expenditure in a proper direction saved suffering and expense in other directions.

Mr. H. SADLEIR RIDINGS (London) said he was reminded, while listening to the paper that had been read, how surveyors and engineers employed by local authorities were obliged, often upon the spur of the moment, under the orders of the board, to work out plans for infectious diseases hospitals. In order to keep the pot boiling years ago, he had had to work under a local authority in England. He got such an order; it came suddenly, and he had had no previous experience of the matter. Yet he had to do the best he could, and a number of friends, who were much better acquainted with such matters than he was, helped him out. He laid the plans before the board, but he was bound to say he was thankful now that those plans were never carried out, for he had never had a mirror held up to him which showed to such an extent his own defects and shortcomings, as he had had that morning while listening to the admirable paper of Mr. Hall. It is hoped these few remarks may be used to induce local authorities to employ architects who (like Mr. Hall) are experts in such cases, otherwise very serious results may follow. It is unreasonable to expect surveyors of any but great sanitary districts (such as that of our President), who have a large staff under them, to be up-to-date as regards the requirements of infectious diseases hospitals in the midst of the ordinary multifarious duties of their office.

Mr. EDWIN T. HALL (London), in replying on the discussion, thanked the last speaker for the flattering tribute he had paid to him. Dealing with the speakers *seriatim*, he said Mr. Blackham had touched on the case of architectural treatment. He (the speaker) did not for a moment suggest that anything lavish should be employed. He did not ask for huge observation towers, but at the same time a hospital should not be built on the parsimonious plan, a square block with a certain number of holes in it. It was better to have a fine building, educative to the eye. He hoped every ratepayer would see that it was better to pay a little extra, and get something which did not disgust him every time he saw it. With regard to the suggestion that hospitals became infected and must be torn down, such a theory was absolutely exploded. If they were dealing with a hospital built of absorbent material only there might be something to be said on the other side. With sanitary surfaces, with no receptacles for dirt or disease, a hospital could not become infected. He might mention that a London fever hospital after

50 years' existence was as good as ever at the present time, and in all probability would exist for another 50 years unless an earthquake came to London. With reference to the remarks of Mr. Udale, he (the speaker) had given them a description which applied to wards of 12 beds and upwards. He had taken the principle upon which to construct a hospital of 12 beds. The same principles could be applied to a medium hospital of 180 beds, and to a large hospital of 600 beds. The same principles absolutely governed the construction of a little hospital or a large one. With regard to the question of establishment charges, he could not possibly answer them, An architect was supposed to know a great many things, but not the cost of maintenance of a hospital. He was exceedingly obliged to Major Scott-Moncrieff for his remarks. He was very pleased to hear that Major Scott-Moncrieff supported his view in regard to central stacks. A colleague of his, Major Leslie, had seen his (the speaker's) stacks, and was much pleased with them. As regards a hollow space under the floors, he objected to anything like a space. His suggestion simply was that the ground floor should rest on a series of open arches, leaving an open dwarf story accessible at every point. In this the pipes of the heating apparatus were placed, so that workmen could get at them without the necessity of going into the wards. Dr. Pattin had referred to the question of nurses being most comfortably housed. The Metropolitan Asylums Board had taken a most liberal view of that. At the Park Hospital they had a separate dining-room, separate drawing-room for each class of nurses, and a joint library. On the question of excreta, he was delighted that Dr. Wilson had reason to say there was no evidence of any danger by discharging it into public sewers. On the question of danger from scarlet fever hospitals, the Local Government Board had made careful investigations on the subject in 1888. There was danger in the neighbourhood of small-pox hospitals, but there was nothing to be feared from scarlet fever hospitals. To impose upon a sanitary authority like Leeds, Liverpool, Manchester, the necessity of burning their excreta, and still more to apply it to London with a hospital population of say 6,000 patients was something too ghastly for words. They would have to have a crematorium at each hospital, and would have to collect the excreta in tanks. He thought himself that the evil, if there were one at present, was infinitely preferable to the suggested cure. With regard to the question of cold air, they could at any time raise the temperature to 60 degrees right through the ward. Coming to the remarks of Mr. Mason and Mr. Nield, these questions were constantly asked. He hoped people who asked them did not simply do so with the hope of getting some figure which they could go away with and say, "Look you are wasting the ratepayers' money." Of course he did not say that was the object for which the questions were asked in this case. Building tenders were asked for in public competition, and the money was, therefore, spent in erecting up-to-date sanitary buildings at the least possible price. Every penny spent was well spent, and there was no waste whatever in it. In the Park Hospital the cost

was about £400 per bed. The cost at the Brook Hospital he could not tell them, as the accounts were not made up. St. Thomas's Hospital, which was not an infectious diseases hospital, cost over £500 per bed, and Glasgow Hospital cost over £500 per bed. Let them remember that the cost of £400 per bed was in London. In the country it would not cost that sum. It was his duty a year ago to answer a very difficult question. He was asked: "How is it that certain hospitals in the country are built at something under £300 per bed whilst London hospitals cost so much more?" He got information from 40 towns all over the country, and found that a cost of under £300 in the country was more than equivalent to £400 in London. In 30 principal towns in England wages were 33 per cent. less than in London, and materials 30 to 45 per cent. cheaper. The cost of the North Eastern Hospital (London) he did not know.

"*Temporary Dwellings for Public Works,*" *by* R. W. NEWMAN, Assoc.M.Inst.C.E.

(MEMBER.)

ABSTRACT.

THE construction of railways, canals, and works for the water supply of large towns, passing through rural districts, has led to the necessity of providing accommodation of a temporary character for the men employed by the contractors for these undertakings.

The author, while taking a typical form of hut, touched upon the points in which these buildings differ from structures of a permanent character.

The building, which is framed of wood and has only a ground floor, raised above the ground level, may be covered externally with galvanized sheets, wood, or felt, and internally with grooved and tongued boards, paper, &c., and has the following rooms:—Kitchen, scullery, larder, men's bedroom, and two bedrooms for the landlord and his family.

All drains should be kept outside the hut, a trapped gully being placed close outside the scullery door, an ample supply of water being provided close at hand.

The provision of privy accommodation requires special attention—that no accumulations shall take place, separate privies being provided for each sex, and urinals to each hut, these being filled with sawdust which is frequently changed.

The disposal of refuse needs to be carefully seen to, the author strongly recommending the keeping of pigs at a sufficient distance from the hut.

The position which the Public Health Acts take up on this question is briefly referred to, with special reference to the powers given to Local Authorities (with the consent of the Local Government Board) to make bye-laws for the conduct of houses let in lodgings other than common (licensed) lodging houses.

The author ventures the opinion that these "huts" provide more suitable and healthier accommodation than is obtainable in the majority of the houses in rural districts, seeing that they are built to fulfil a definite purpose, and in conclusion gives figures to prove that these buildings, far from being a source of revenue to a contractor, are, contrary to the commonly accepted view, a source of very considerable expense.

"*On the Disposal of Refuse in a Mining Village*," *by* ARNOLD LUPTON, M.Inst.C.E.

THE sanitary arrangements in any considerable town must necessarily include sewers, in order to deal with the liquid refuse from the houses and works in the most economical manner.

A village situated in a country district where land is cheap, is obviously under different conditions than a town, and may require different treatment to produce the best results, and a system of sewers which is suitable for a thickly populated town, may be very unsuitable for a thinly-populated country district.

A sewer in which there is no constant flow, or in which there is a damp deposit with no flow whatever, cannot be anything else than a generator of sewer gas.

Every person who has had the misfortune to pass by the manholes of the sewers in country districts, will have frequently had evidence of this fact.

If, therefore, sewers are laid down in such a district, it is necessary that they should be washed either with a perpetual flow of fresh water, or with a frequently repeated flush, say once every twelve hours, sufficient to sweep the drain clear, and even then this measure will very likely be unsatisfactory, unless the drain is very smooth and very carefully laid.

In order to avoid the evils of sewers, the author has laid out a mining village on the following plan:—

The houses are built in blocks of six and eight, with small gardens in front, concreted or paved yards at the back, and gardens at the ends of the blocks.

There are back roads to each house as well as front roads.

Water is laid on to each house, and each house has a bath.

In the back yard adjoining the back road is an earth closet or ash closet, being intended to use the ashes of the house fires in the place of earth, or if these ashes should be insufficient in summer time to supplement them either with ashes from the colliery fires or with earth from the fields.

There is no separate ash pit or receptacle for refuse. All the solid house refuse goes into the pail of the earth closet.

This pail is emptied every day on to the land in a field at a little distance.

In this way all the solid refuse is removed from the premises every day, and therefore there is no festering heap of decaying vegetable or animal matter in the village at all.

The slops from the sink, bath, &c., go down an open gutter laid at a suitable gradient across the back yards, and are led to a small filter bed in the garden. There is a filter bed for each block of six or eight houses. This filter bed is formed with a concrete floor and brick walls, and is about eight feet square inside.

The bottom is laid with six rows of 2-in. drain tiles which lead through a division wall by which one foot in length of the filter bed is partitioned from the other portion.

The drain tiles are covered with broken stone and gravel and on the top of that ashes.

The slops are led by the gutter on to the top of the ashes, through which they filter to the drains below into the clear well.

Leading from the bottom of the clear well is a 3-in. sanitary tube connected with a drain which leads to a field.

The effluent from this drain is clear, but it is distributed over the land in the field, and before it can sink through the soil into the rock below it will be completely purified.

The sanitary tube is not likely to be a generator of sewer gas, because the liquid passing through having been filtered has but little matter in it that has not been dissolved.

It is considered that by this plan the ordinary dangers of sewer gas are avoided, and that there are no drains at all upon the property, the gases from which would be likely to assist in the development of fevers.

This system is now being carried out by the author in a village that will probably number 500 houses in two or three years.

The filter beds are applicable also where water closets are used. Twelve years ago the author erected a similar filter bed for a country house with perfectly satisfactory results.

Mr. J. E. **Willcox** (Birmingham) said that in the absence of Mr. Lupton he hesitated to say anything about the paper, but he would have been glad to get a little further information on several points, and especially as to the filter beds and open gutters. He gathered that the open gutters were taken across every house yard to the next house yard. He thought that such a gutter would be very objectionable in winter time, and especially in frosty weather. If they saw some of these open gutters and multiplication of filters, which are practically cesspits, they would agree that it was not desirable to build near them. It appeared to him it was accomplishing at several points in the vicinity of the houses what should be readily and more economically done at the Sewage Disposal Works; the filters are nothing but strainers, and are liable to be very offensive.

Mr. H. W. **Taylor** (Newburn) said that the method described by Mr. Arnold Lupton seemed to him somewhat unusual in the treatment of sewage. He had had considerable experience of mining populations, and he was sorry to say that they were not by any means a specially cleanly community. He thought open gutters in mining villages were a mistake. They were always being choked up, and invariably smelt bad. With reference to the proposal that refuse and faecal matter should be put into pails and emptied every day, that was all very well in theory, but it did not work in practice. To empty the pails every day they would require a special man to look after them, and colliery owners were not generally disposed to spend more than they could help, and he really thought that any expense like that should be borne by the Local Authority. He also asked *where* this model village was, and whether the sanction of the Local Government Board had been obtained for this scheme. As Mr. Lupton was not present, he asked that this information might be supplied later.

Dr. **Eustace Hill** (Durham) said he agreed with the remarks of the two previous speakers with regard to the open channels. There was no doubt that the open channels, whether long or short, frequently happened in the colliery villages in the North of England to be most objectionable, and it was a pity that they should hear a suggestion of their perpetuation. The filter beds, described by Mr. Lupton, would be quite unworkable. There was really no difficulty in a village of the size mentioned in collecting the sewage, and in the county of Durham that had been done. The collection of the refuse in pails and its daily removal was, he thought from his experience of colliery villages, somewhat Utopian. The pail system was more objectionable than having small fixed receptacles with a hatch for scavenging, which were cleaned out perhaps once a week. There was no doubt that where vegetable refuse was put into pails of the kind described and not quickly removed there would be a considerable nuisance, but all such refuse should be burned. His experience of colliery villages was that the slop-water was as offensive as the sewage of any large town. Pitmen, from the nature of their work, got very dirty and used a great deal of soap, and this soapy-water mixed with urine produced a very strong sewage. As a matter of fact there was no sewage more offensive and more in need of a proper system of sewage disposal than that of a colliery village, and he was sure that the method of sewage disposal proposed in the paper would not prove satisfactory.

Mr. J. E. Parker (Newcastle) said he had some considerable experience of sewage in colliery villages, and he was very much surprised at some of the suggestions in the paper. In getting rid of the matter which came from the colliery villages the small filter beds would very soon become choked, because of the large amount of colliery dust which was carried from the men's bodies in the process of washing. They had had some filters at several of their works for colliery villages, and they had had great difficulty in keeping the surface clear. He could endorse what had been said in reference to the open channels. They had open channels in many villages a the present time, and had found it necessary to have them constantly cleared because the inhabitants would insist upon throwing sewage matter into them. In the winter time the matter in these open channels got frozen, the subsequent sewage overflowing the pervious streets and becoming most objectionable.

The President of the Section (Mr. Lewis Angell) said it was a great mistake to suppose that slopwater was not as offensive as sewage. It was even more so, and it was not to be thought that in the absence of excreta the water was not otherwise polluted.

Mr. A. Lupton (Mansfield), who was unable to attend, has sent the following reply to the discussion: He admitted that an open gutter might occasionally be a nuisance, especially in frosty weather, but submitted that a covered gutter might also be a nuisance in frosty weather, and was much more dangerous. He had been living in mining villages all his life, and knew that when the ordinary system of sewers was laid down it was generally followed by an epidemic of fever. There had been many instances within his own experience, and he made no doubt that his own experience was not singular. It was better to endure a little occasional unsightliness than to risk illness and death resulting from sewers in country villages. He thought, however, that it was much easier to clean an open gutter than a covered one. Who could ensure the cleanliness of an underground drain? Whereas it was easy to ensure the cleanliness of an open drain, which could be swept out and flushed three times a day if necessary. He had known mining villages where there were no drains at all, and no fevers. With regard to his filter beds, he had had 12 years' experience of a similar filter bed, which was in every way satisfactory during the whole of that time. It dealt not only with slops, but with a water-closet, and it was this 12 years' experience that had convinced him of the efficacy of the filter for dealing not only with slops, but with water-closets. In the new village to which he had referred he had not adopted the water-closet system, but the filter beds adjoining each block of cottages would be quite adequate if water-closets were added. By filtering the liquid, or liquid-carried refuse immediately adjoining the house, the long sewer-gas-generating drain adjoining the house was avoided. He was happy to say that his plans had had the approval of the County Medical Officer of Health. The pails received all the solid refuse of the house and excreta, the ashes from the fires helped to prevent smells; but the pails were regularly emptied every day, and there being no ash-pit there was no festering heap of vegetable or animal matter near the house.

"*The Treatment of Domestic Slop-water in Isolated Houses*," *by*

G. V. Poore, M.D., F.R.C.P.

(Fellow.)

It is often stated that to deal with slop-water separately from excremental matters is no advantage either from a pecuniary or sanitary point of view, because:

1. Slop-water is as foul as sewage composed of excrement and slops.
2. A system of sewerage is necessary for the slop-water, and it is not easier to treat slop-water alone than it is to treat a mixture of slops and excrement.

The following tables from the 'Report of the Royal Commission on Rivers Pollution in 1868' is given by most Sanitarians to show that the difference in degrees of impurity between a water-closeted town and a non-water-closeted town is very slight.

Average Composition of Sewage.

In Parts per 100,000.

Description.	Total Solid Matters in Solution.	Organic Carbon.	Organic Nitrogen.	Ammonia.	Total Combined Nitrogen.	Chlorine.	Suspended Matters. Mineral.	Suspended Matters. Organic.	Suspended Matters. Total.
Midden Towns	82·4	4·181	1·975	5·435	6·451	11·54	17·81	21·30	39·11
Water-Closet Towns	72·2	4·696	2·205	6·703	7·728	10·66	24·18	20·51	44·69

In Grains per Gallon.

Midden Towns	57·68	2·926	1·382	3·804	4·515	8·078	12·467	14·910	27·377
Water-Closet Towns	50·54	3·287	1·543	4·692	5·410	7·462	16·926	14·357	31·283

This table being not unfrequently quoted in support of the contention that slops alone = slops + excrement, I may be excused if I examine it somewhat critically.

I will take the table in grains per gallon and simplify it a little.

Grains per Gallon.

Description.	Total Solids in Solution.	Suspended Matter.		Total Solids in Solution and Suspension.	Organic Carbon.	Ammonia.	Total Combined Nitrogen.	Chlorine.
		Mineral.	Organic.					
Midden Towns	57·68	12·467	14·910	85·057	2·296	3·804	4·515	8·078
Water - Closet Towns	50·54	16·926	14·357	81·823	3·287	4·692	5·410	7·462

We shall all of us be ready to grant that the addition of excremental matters must be something *extra* added to the sewage, and that such extra matter must be either in suspension or solution. The fact therefore that the total solid and suspended matters is less by 3¼ grains in the water-closet towns than in the midden towns, can only be accounted for by the enormous dilutions of the excremental matters in the sewage. Notwithstanding this dilution we find that the water-closet town sewage contains 20 per cent. more combined nitrogen than midden town sewage, 23 per cent. more ammonia, and, what is very remarkable, 35 per cent. more suspended mineral matter.

This excess of mineral matter in suspension could only be caused by the precipitation of mineral matters by the ammonia and sulphuretted hydrogen formed by decomposition of the albuminous and other organic matter. This excess of mineral matter in suspension must therefore be taken as a measure of the enormously increased putrefaction in water-closet sewage, a putrefaction probably to a great extent brought about by the millions of microbes which are provided from the human intestines with the excrement, and we must therefore assume that the increase of mineral matter in suspension is an indication that a large quantity of foul putrefactive gases has been given off into the streets and houses of water-closet towns.

This table, therefore, seems to me to conclusively demonstrate that the sewage of water-closet towns is far more bulky and far more filthy and dangerous than the sewage of midden towns.

Sewage is not to be regarded too absolutely from its chemical side. We must use our senses, inclusive of our common sense, in coming to a conclusion, and we must not pin our faith on analyses alone.

The ingredients of household slops, unlike the fæces, are little liable to contain pathogenic microbes. The urine of a healthy man is, as we all know, sterile when passed. In diseased conditions it may occasionally possess infective power, but this is a speculation rather than a practical fact acknowledged by the sanitarian. A large proportion of cooking water has been boiled, and is therefore sterile, and the same may be said of the water in which our linen has been washed. Household slops therefore are not liable to be really infective.

They are nitrogenous, and consequently, if allowed to stagnate by mismanagement, they become very foul from decomposition, but that they are capable of producing epidemics has not yet been proved. Between excrement and slop-water there is this difference, that solid excreta are foul-smelling *ab initio*, but slop-water (if we except the smell of water in which cabbage has been boiled) only becomes foul if it is mismanaged.

In places which are not overcrowded a great deal has been done when the wholesome treatment of the solid excreta has been arranged for, and I feel that to neglect the doctrine that 'half a loaf is better than no bread,' and to discourage people from dealing with solid excreta, because they do not see their way quite clearly for the disposal of slops, is most dangerous.

One thing is certain, viz., that if the solid excreta are dealt with by dry methods the liquid sewage will be 25 per cent. less bulky than otherwise would be the case.

I feel sure that if, in our anxiety to prevent the pollution of rivers, we fail to appreciate the biological differences between excrement and slop-water we shall make a mistake, which in the end will be no real advantage to the streams. If therefore villages and places where the population is sparse make serious efforts to deal with excreta, they should have at least some breathing time allowed before the fish in their streams are deprived of the luxuries which they doubtless obtain from kitchen slops.

When fæcal matters are mixed with the slops, the mixture is so offensive that we are compelled to place it at once beyond the reach of the nose or eye, and the presence of sticky fæces and large quantities of paper makes any attempt at filtration practically impossible. Domestic slop-water when fresh is not offensive, and is very rarely dangerous; and by attention to certain details it can be easily dealt with.

Domestic slop-water consists of:

1. The waste from kitchen and pantry sinks, which often contains dissolved albuminous matter, food particles, dissolved and suspended fat, a considerable amount of coffee grounds and tea leaves, and sundry odds and ends, the result of house-cleaning, such as fluff, bits of string, little scraps of paper and rags, fibres from brooms and brushes, &c. These materials are very apt to accumulate, and to block drains; and if this form of slop-water is to be effectually dealt with, it is essential that the suspended matter be strained out. The purposes which the kitchen and pantry sinks subserve require, according to Notter and Firth, about 3·75 gallons of water per head per diem; and allowing for evaporation, the slop-water must be less in quantity, so that if we say that these slops average 24 gallons per diem for a household of 7 persons, we shall be not far from right.

2. Bedroom slops, consisting of soapy water and urine. Allowing for a daily sponge bath these amount to about five gallons per head per diem or thirty-five gallons for a household of seven persons. The suspended matters in these slops (soap-suds, chiefly) are in such a fine state of division that they easily filter. They may contain waste matches, a few hairs, a small amount of fluff from towels, and an occasional bit of paper.

3. The water from fixed baths amounts to about thirty gallons per bath per diem, and in a household of seven, would not probably amount to more than sixty gallons a day. It is so clean then that it ought not to occasion any trouble.

Assuming the clothes - washing is not done at home we should have fifty-nine gallons per household of seven per diem without fixed baths, and 119 gallons with fixed baths; and if the washing be done at home then three gallons per head per diem must be added, or twenty-one gallons for a household of seven, giving a maximum of 140 gallons per diem for a household of seven.

Fifty-nine gallons per diem would be put upon an acre of land the equivalent of an inch of rain (22,624 gallons) in 384 days, and the equivalent of an inch of rain on a quarter of an acre in 96 days.

One hundred and forty gallons per diem would be the equivalent of an extra inch of rain on an acre in 162 days.

These amounts are trivial, and if the water be supplied from a private well in the grounds it is evident that, allowing for evaporation, *we should pump from the subsoil rather more than we return to the surface.* Again, it must be remembered that the house with the greatest amount of slops has, as a rule, the largest curtilage. A mansion containing twenty persons with unlimited baths, laundry, and stables would not probably give more than 40 gallons per head or 800 gallons a day, which is a trivial amount when considered in connection with a park of 20 or perhaps 200 and more acres.

It is necessary to insist that the amount of slop water to be dealt with in isolated houses is usually trivial in proportion to the land available for its purification. Tidy was of opinion that, employing intermittent downward filtration for the purification of previously precipitated crude sewage, an acre might be sufficient for 7,000 persons. This would give $\frac{1}{1000}$ acre, or about 44 square feet for a household of seven. At this rate my consulting room in London, which measures 24 × 18 = 432 square feet, would be an area large enough for nearly 70 persons. I think the estimate is too small, but even if one multiplies it by ten it is evident that the amount of land necessary for treating the domestic slop-water of a house is much smaller than might be supposed.

In places where unlimited water is obtained by merely turning a tap these estimates are very liable to be exceeded, especially when those who turn a tap *on* are too forgetful or lazy to turn it *off*.

I feel certain that anyone who experiments on this matter as I have done will be simply astounded at the small amount of ground which is necessary.

Critics of the plans which I have advocated and am now about to advocate, sometimes hint that the whole curtilage of one's house must be unwholesomely sloppy.

Such a statement shows a complete ignorance of the whole subject.

Few, if any of the writers of hygienic text-books, seem to have really studied the life history of slop-water, and it is matter for regret that in some of these books the chapters devoted to domestic hygiene deal more with patents than principles, and are illustrated more by woodcuts culled from tradesmen's catalogues than by any practical knowledge possessed by the writer.

PRINCIPLES OF SLOP-DRAINAGE.

If domestic slop water is to be dealt with successfully it is necessary—

1. *That all waste pipes terminate well above the level of the ground.*

This is a point too much neglected by architects, who are very prone to carefully put all waste pipes below ground level, so that any purification of slops without pumping is impossible.

Allowing a fall of say 1 in 10, it is evident that for every foot above ground at which a waste pipe terminates, it is possible to deliver the waste on to the surface of the ground at 10 feet from the house. Thus the bedroom sink waste at a height of 10 feet above ground level might be made, if so desired, to deliver its waste 100 feet from the house. It is often necessary to take the waste pipes from the first floor over the path surrounding the house. This is easily accomplished without causing any unsightliness by placing an arch over the path. Such arches may be of galvanized iron for a cottage, or of masonry for a mansion, and are soon hidden by creepers.

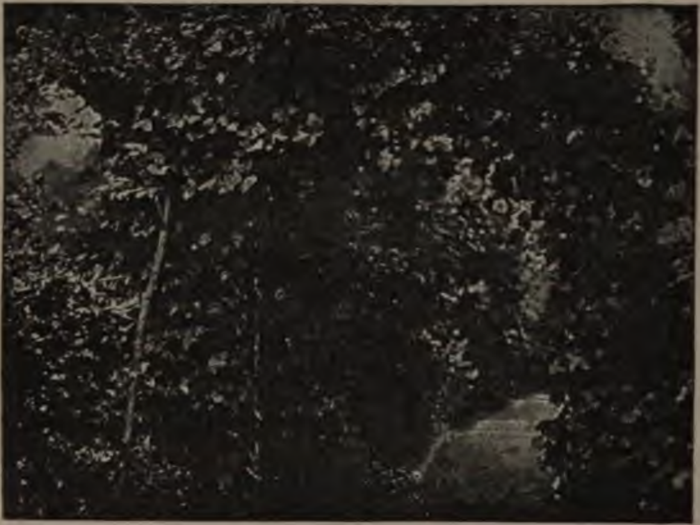


FIG. 1.

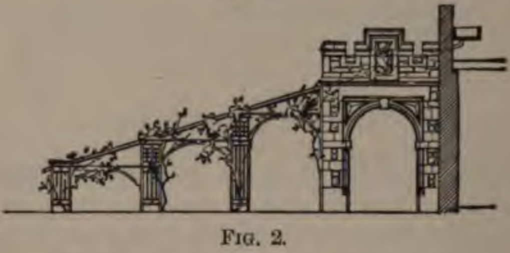


FIG. 2.

Figs. 1 and 2 illustrate how this principle may be carried out; in the one case by a rustic arch costing a few shillings, and in the other case by a porch and arcading of a more ambitious description. Fig. 1 is from a photograph of an arch in actual use. Fig. 2 has been furnished by Mr. Cutler.

When pipes are provided with a rapid fall there is little tendency for water to freeze in them, but in severe climates it might be necessary to pack the pipes.

The waste pipes of kitchen and pantry sinks are, in London, almost always below ground level, it being the custom to place the kitchen and offices in an underground basement; and I have known London architects who have provided country houses with similar abominations, so that the sewage of a basement has to be lifted before it can be properly treated. If this evil is to be avoided, it is essential that the waste pipes of kitchen and pantry sinks terminate at least two feet above ground level. This is a minimum, and if a greater fall can be obtained, so much the better. Kitchen and pantry waste is full of dissolved and suspended matter, and a careless cook wlll throw down the sink enough food to keep a pig or a dozen fowls. This waste is very prone to become offensive, and it is advisable that it be thoroughly strained before flowing away. Not only should the waste pipe have a fixed and immovable strainer below the plug, but a sink basket should be used and the waste should be still further strained in a manner to be presently described.

2. *No stagnation must anywhere be permitted along the line of slop-drainage.*

Experimenting upon this point I have found that stagnant slops become, as a rule, offensive within twenty-four hours, even when exposed to the air. Thus I tried the experiment of filtering bed-room slops through a trough filled with stones and provided in the middle of its length with a diaphragm reaching from the top to within an inch of the bottom, and having the outlet only an inch or so below the level of the inlet. This caused stagnation and great foulness, which disappeared immediately the outlet was placed at the lowest level, and stagnation became impossible. Soapy water mixed with urine soon becomes foul if allowed to stagnate in traps, but it has never in my experience been foul if poured upon the earth and allowed to soak away. With a good fall and with the outlets of pipes freely exposed to the air, traps are not necessary, and as all forms of traps are but miniature cesspools, this is a great gain. A trap is never possible in an outside metal pipe because of the fear of frost. The abolition of traps is not only necessary, but a very great advantage indeed.

3. *Slop-water should run in open gutters, and when it has reached a certain distance from the house, it should be allowed to soak away as it runs, and take the line of natural drainage of the locality.*

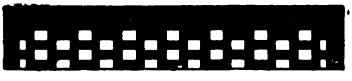
This may be effected by means of

FILTRATION GUTTERS.

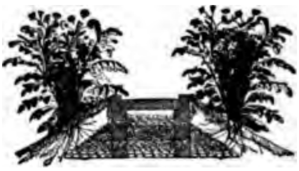
The gutters which I have used, and have found to answer in a manner far exceeding my expectations, are constructed as follows:—

A trench two feet deep and eighteen inches wide, and of a length varying with the circumstances, is dug and filled up with porous material, such as builders' rubbish, old crockery, and tins, stones, &c., &c., to within a few inches of the surface, and upon this rubbish, previously rammed, walls of concrete or honeycomb brickwork are formed, provided with a ledge sufficiently wide to support a perforated tile, the perforations being big enough to admit a large size knitting-needle, say one eighth of an inch in diameter. The porous rubbish reaches to within an inch of the under surface of the tile and the sides are planted. The gutter may, if necessary, be protected by a grating.

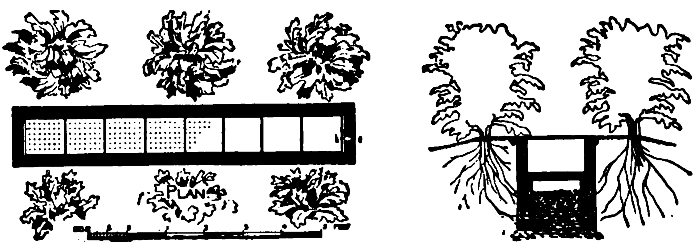
Or the gutter may with great advantage be placed upon a bank with gradually sloping sides. This latter form is necessary on clay soils.



ELEVATION OF BRICKWORK.



SECTION.



FIGS. 3 AND 4.

In both cases the sides of the gutter should be planted with quick growing shrubs, and it will soon become ornamental. Such a slop-gutter on a raised and planted bank would form a most excellent boundary fence. These gutters are shown in figs. 3 and 4. The perforated tile which forms the floor of this gutter is a most important part of it, because it allows the gutter to be cleared of dead leaves and other rubbish which inevitably fall into it, and it protects the porous material from getting clogged. It breaks the force of the water and prevents the downpour from the pipes from ploughing up the rubble, which is a most important matter. I have used various things for forming the floors of these gutters, and have found nothing better than the perforated tiles which are used for forming the floors of malt kilns. I have no doubt that the gutter could be made perfectly well in galvanized iron. What lengths of such gutters should be provided? To answer this question I can only give my own experiences.

Two years ago I constructed such a gutter for a girls' school where there are between thirty and forty day scholars and boarders. I dug out my trench leading into a natural rivulet and I formed a gutter forty feet long. I do not think the slops in this case have ever travelled as much as six feet, and there is no evidence that a drop of slop-water has ever touched the rivulet. The privets have grown, but the gutter has never been foul, and when the tiles have been taken up the porous rubbish beneath has been found perfectly sweet, and there has been no sloppiness at the sides.

A similar gutter on a bank was provided for a six-roomed house, and the slop-water has never travelled to the end, or anywhere near it, notwithstanding a considerable fall.

The water of a fixed bath has run for nine years into a gutter 20 feet long, and at times as much as 120 gallons a day has flowed into it, but the water is never visible two minutes after the waste has ceased to flow; there has been no foulness of any kind, and the only effect has been to make the shrubs grow.

The bed-room slops of a country mansion, with twenty-three inhabitants, was taken, eighteen months ago, into a plantation, and the only result has been that the limes have thrown up suckers, but there has been neither sloppiness nor foulness.

The bed-room slops of a cottage with five inhabitants have run for five or six years along a gutter 12 feet long, at the foot of a privet hedge, and there has been neither sloppiness nor foulness, except when, as stated above, I produced stagnation.

4. *When it is feasible, it is advisable to allow different varieties of slops to flow in separate gutters.*

The waste of fixed baths is almost clean, containing nothing but a little soap at most; bed-room waste contains soap and urine, but no solid particles of any size to give trouble except a stray bit of paper, or an old match, or a few hairs, and some fluff from towels, which will all be caught upon the perforated tiles, and can be swept up occasionally.

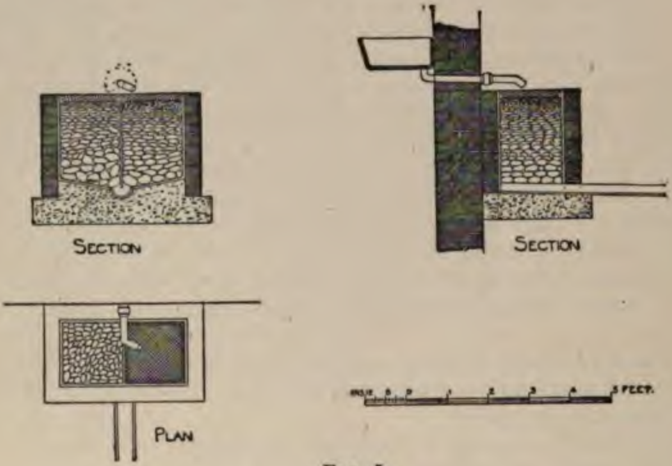


Fig. 5.

The waste from kitchen and pantry sinks needs careful straining and filtering before it is allowed to flow into an open gutter. I have mentioned the necessity of providing strainers and a sink-basket, and I now proceed to describe the slop-filter which is advisable for the kitchen sink (fig. 5). The waste-pipe of the sink must terminate 2 feet or 2 feet 6 inches above the ground level, and be provided with a reversible nozzle delivering over a filtering vessel made of concrete or iron. This filter is in duplicate, and is provided with a diaphragm reaching to within an inch of the bottom. Each half of the vessel measures 1 foot by 1 foot 6 inches, and is 2 feet 6 inches deep, and has a capacity of 3·75 cubic feet. The outflow is immediately beneath the diaphragm, and empties into the open gutters. Each half of the filter is filled with stone varying in size from a hazel-nut to a walnut, and the waste is allowed to flow through one half of the filter, and then when that half gets foul the nozzle is reversed, and the second half is brought into use, and the half first used can be cleaned out. The filter must be provided with a fine copper strainer, and if the slops be carefully strained the filter will not get foul for months; but if lumps of fat and slabs of cabbage-leaves be allowed to get into the filter it soon gets foul, as does the abomination known as a fat-trap.

The method of purifying sewage by "intermittent downward filtration" is well understood, and the methods advocated here are merely modifications of what has been done in this country, and also by the Massachusetts Board of Health.

What is meant by "intermittent downward filtration?" How frequent are the intermissions?

The intermissions usually recommended are "sewage for six hours and rest for twenty-four hours," but my belief is that the purifying action of the filter-bed ceases directly the filter is filled and water-logged. The intermissions must be perpetual. The supply of slop-water in a private house is essentially intermittent, and this perpetual intermission is the secret of the success of the methods I have indicated. Between nine at night and seven in the morning (ten hours) out of every twenty-four the flow of slop-water is usually nil. Between 8 a.m. and 11 a.m. is the time of the bulkiest flow, but even this intermits. A housemaid's pail with its three or four gallons will come once in ten or fifteen minutes, so that the filter is always being emptied, and as the water drains off the fresh air follows it. The water of a fixed bath is practically clean, and gives the filtration gutter a vigorous stir, which does nothing but good. The domestic intermissions are invaluable. When sewage is collected in a tank and is then allowed to flow *without intermission* for six hours at a stretch it is doubtful if the greatest purifying power is obtained from the filter.

Another point of great importance is the bestowal of rain-water. The usual method is to conduct the rain-water from the eaves by means of pipes which open directly into an underground sewer or empty over a gully which runs into an underground sewer. This underground sewer conducts the rain-water either to a main sewer or cesspool, and the important fact to be borne in mind is that the length of underground pipes whose main function is to conduct rain-water are nothing but prolongations of sewers or cesspools which conduct the gases of putrefaction to many points round the dwelling either at the ground level or the roof level.

There can be no reason why rain-water pipes should not end in a "shoe," and discharge over open gutters which might flow to a gully, if absolutely necessary, at a *distance* from the house.

The practice of taking rain-water direct into underground drains is a great cause of damp walls. A year or so ago the rain-water pipes of a country house well known to the author, which ran direct apparently into the underground drain, were examined. In every case the underground drain was broken and leaky, and in some places completely choked by the roots of plants and trees, while the rain-water got away as it could, and kept the foundations of the walls perpetually soaked.

In the London house, with its cave-dwelling basement and narrow area, it is inevitable that the rain-water must flow to an underground sewer more or less directly, but there is no reason why this cockney necessity should be adopted in the country. It is obviously advisable to conduct rain-water clear of the walls and foundations. The mediæval gargoyle was useful in this way, and I think I am right in stating that the "flying buttress" was occasionally made to serve the purpose of a water-gutter with the same object.

Mr. W. J. **Dibdin** (London) moved a vote of thanks to Dr. Poore for his paper, which was, he considered, one of the most valuable that had been before the Section. The principles which Dr. Poore had enunciated were so entirely true and correct, that everyone who had heard them must be grateful to Dr. Poore, not only for the lucid, clear, and definite manner in which that gentleman had placed them before the Section, but also for the information which he had given at the same time. He had stated that he had used this system of filtration for over three years, and that was a very valuable statement, for these questions were questions which time alone could solve. He had also found that the bacteria conveyed oxygen to the organic matter. He hoped for the very rapid advance and the speedy solution of the sewage problem.

Mr. H. **Alfred Roechling** (Leicester), in seconding the motion, said there was only one point to which he wished to draw attention. Of course they would deal with the slop-water before the putrefactive changes set in; otherwise, he took it, Dr. Poore would not recommend treatment close to the house.

Dr. **Poore** intimated that this was so.

"*The True Principles of Sewage Purification*," *by* W. KAYE PARRY, M.A., B.E. Univ. Dublin, Assoc.M.Inst.C.E.

(MEMBER.)

ONE of the subjects suggested for discussion at the present Congress is the scientific basis of sewage purification, and we are also invited to make the Congress and Exhibition commemorative of the Victorian era.

We may safely say that Her Majesty's reign has witnessed both the birth and the development of the sewage problem, and that the period which has elapsed between the Golden and the Diamond Jubilees has witnessed a very marked development in the researches on this important subject.

Ten years ago little or nothing had been heard of the bacteriology of sewage. Few, if any, recognised that sewage purification involved biological problems, the solution of which was of far more importance than the chemical questions.

In the present day we hear a great deal about the bacteriological treatment of sewage, and it is therefore worth while to stop for a moment to consider upon what scientific basis the question rests.

All those who have interested themselves in the literature of sewage purification are familiar with certain landmarks which serve to act as mile-stones on the road towards success. One of the earliest of these landmarks is to be found in the Report of the Select Committee of the House of Lords on the Rivers Pollution Bill, dated 1873. It was then that the difficult question of standards of purity was first seriously discussed. Next, we may note the Reports of Dr. Angus Smith, published in 1882 and 1884. The latter year is also marked by the two Reports of the Royal Commission on Metropolitan Sewage Discharge. These historic documents, as we all know, have formed the scientific foundation upon which the Local Government Board have based their requirements ever since.

Again, in 1891, the transactions of the International Congress of Hygiene in London, furnish us with an admirable resumé of the general state of our knowledge at that period.

The next landmark is furnished by the Report of the Royal Commission on Metropolitan Water Supply, published in 1894. Here for the first time we observe more distinct references to the bacteriology of water in relation to its suitability for dietetic purposes. Nor must we omit to mention the valuable series of reports of the State Board of Health for Massachusetts.

In addition to all the foregoing Reports many able works on sewage purification have been published both in this country and in the United States; amongst others may be mentioned the writings of Mr. Santo Crimp, Professor Robinson, Dr. Corfield, Mr. Dibdin, Mr. Thomas Wardle, Messrs. Rafter and Baker.

The object of the present paper is to bring under the notice of the members of the Congress the researches of a chemist, whose contributions to the literature of sewage purification are, perhaps, not as widely known as their merits would entitle them to be.

In a short paper read at a Congress, it would be quite out of place to attempt anything like a complete account of the nature and extent of the research work which Mr. Walter E. Adeney has accomplished since 1887. His writings will, however, speak for themselves, and those who wish to form an independent judgment as to the value of his work and the reliability of his methods cannot do better than peruse for themselves the papers which he has read before various scientific societies during the period referred to. His researches had extended over some years before he commenced to publish any results. As far as the author is aware Mr. Adeney's first paper was read before the British Association at the Cardiff Meeting in 1891. The subject was "The formation of Peaty Colouring Matters in Sewage by the action of micro-organisms."

In the November and December numbers of the "Health Record" of the year 1891, and in the January and February numbers in 1892 a series of short articles from his pen appeared under the title "Bacteria, as Scavengers of Nature." The title sufficiently indicates the subject dealt with.

In July, 1892, during the Congress of the British Institute of Public Health in Dublin, Mr. Adeney read a paper on "The Chemical Bacteriology of Sewage, its Hygienic Aspect." This paper attracted at the time considerable attention.

A much more important contribution to the literature of the subject will be found in the Scientific Transactions of the Royal Dublin Society, volume V., series II. The title is as follows: "The course and nature of fermentative changes in natural and polluted waters and in artifical solutions as indicated by the composition of the dissolved gases." This paper was read on April 24th, 1895, and particular attention is directed to it; for it contains a very exhaustive account of his researches up to that date, supported by a vast amount of evidence. This evidence takes the form of some thousands of determinations, principally of the dissolved gases in polluted waters and other solutions before and after fermentation.

The same subject was treated in a more condensed form in a paper read before the Institution of Civil Engineers of Ireland, on April 1st, 1896. The title of the paper was "Recent advances in the bacterio-chemical study of sewage and other polluted waters." The Council of the Institution of Civil Engineers of Ireland awarded Mr. Adeney a Mullins large gold medal for the paper referred to, being the highest award which it was in their power to bestow.

On April 21st of the present year Mr. Adeney read another paper before the Royal Dublin Society on "Humus: its formation and influence in Nitrification." This paper has just been published in the Scientific Transactions of the Society, volume VI., series II.

The Scientific Proceedings of the Royal Dublin Society also contain some short notes by the same author referring to different aspects of the same question. Among these may be mentioned a paper "On the Reduction of Manganese Peroxide in Sewage," read February 21st, 1894, and another on the "Chemical Examination of Organic Matters in River Waters," read May the 22nd, 1895.

All those who take the trouble to peruse these publications must admit that they represent an enormous amount of original research work, and that Mr. Adeney's deductions cannot be seriously questioned except by those who are prepared to show that his methods are inaccurate and his results unreliable.

It is almost inconceivable that any fair-minded man could come to such a conclusion, after a perusal of the papers. All the work that had been accomplished, has evidently been done under the most rigid conditions, and with the most marvellous care to secure accurate results. In fact the tabulated analytical data carry on their face the proof of their genuineness, the results all go to confirm each other, and we must either be prepared to prove that Mr. Adeney's researches are a gigantic fabrication, or else we must find ourselves constrained to confirm his conclusions. Mr. Adeney has departed to some extent from the older methods of analysis in his investigations on polluted waters. With the ordinary chemical analysis we are all familiar. Most of us are also aware that there is a certain amount of ambiguity as regards the conclusions to be drawn from such an analysis, and that it is difficult if not impossible to use the figures for the purpose of establishing a standard of purity, or for the purpose of deciding whether a particular liquid is or is not likely to create a nuisance if discharged into a river or stream.

It occurred to Mr. Adeney that a new light would be thrown upon the whole of this question by the examination of the gases contained in such liquids, and of the changes in these gases due to fermentation or other causes. It became in the first instance necessary to devise an apparatus, by which the volumes of the various gases contained in any liquid could be readily and accurately determined. A complete account of the apparatus which Mr. Adeney designed is to be found in his paper read before the Royal Dublin Society in April, 1895.

Time does not admit of a description of this beautiful piece of apparatus, suffice it to say that its value in the chemical laboratory has already been fully recognised. Mr. Adeney claims that by the use of this apparatus, and by the application of the methods which he has adopted it is now not only possible but quite easy to place in the hands of the Engineer an absolutely reliable means of examination of any liquid, and to predicate with absolute certainty the effect of discharging such liquid into any stream.

He has in fact shewn us that the determination of these gases will teach us the whole history of any polluted liquid, and will enable us to trace with accuracy the changes which it undergoes, and to follow them from the moment when it is first polluted to the time when it ultimately returns to a condition as innocuous as that which preceded the pollution.

Mr. Adeney in his Paper to the Engineers, explains at the outset that an examination of his experimental results involves three sets of considerations. 1. The agents or causes which by their operations effect the change of condition of the foul water to that of the purified one. 2. The chemical characters of the polluting matters in the fouled water, in so far as they relate to the agents effecting the change of their composition. 3. The chemical characters and the quantitative estimation of the products which result from the operation of these agents upon the polluting matters.

He points out that before the commencement of his investigations, it was becoming generally accepted that both animal and vegetable refuse matters in waters are oxidised and reduced to simple substances by the operations of micro-organisms and not by mere chemical changes.

To these operations the name bacterial fermentation is now given, because they have been caused by the action of those organisms which are practically present everywhere, and only require the necessary pabulum, such as refuse animal or vegetable matters, for rapid growth and multiplication. The organic bodies which are capable of being operated upon in this way constitute a very large class, and they, together with the ammonium compounds, are included under a general classification as fermentable substances.

Whenever bacterial fermentation takes place in foul water certain products must result. These products will vary according to the conditions under which fermentation takes place, but under certain conditions, the final products formed are few and simple; these products are carbonic acid, water, nitric acid and minute quantities of organic colouring matters, similar to the colouring matters found in ordinary soils and known by the name of "humus."

Mr. Adeney by his investigations has proved conclusively, that this bacterial fermentation takes place in two distinct and well defined stages. For proofs of this statement the writer must refer to Mr. Adeney's publications. It is sufficient here to say that the evidence furnished in support of the assertion appears to be overwhelming. To the first of these two stages, Mr. Adeney has given the name of "bacteriolysis", or carbon-oxidation, and the second is accurately described by the term "nitrification", or nitrogen-oxidation.

It must be understood that the writer is now referring only to the organic matters in solution in a polluted liquid, and he is not dealing with matters in suspension. These matters in solution Mr. Adeney divides into two classes (1) organic compounds (2) ammonium compounds. During bacteriolysis the organic compounds alone undergo chemical changes, the products of these changes being carbonic acid, water, ammonia and a relatively small quantity of organic matter in an altered form. These altered organic matters may undergo further change during nitrification, and may therefore be included in the second division with the ammonium compounds.

Mr. Adeney suggests, as a more accurate division of the polluting matters in solution in sewage, (1) unfermented organic matters; (2) fermented organic matters and ammonium compounds. He proceeds to state that the final products resulting from the fermentation of the second division of the substances are nitric acid, water, and relatively small quantities of carbonic acid. To make these changes clearer Mr. Adeney has prepared a diagram, of which the writer has made a copy, and he begs to draw the attention of the members of the Congress thereto.

It has been pointed out that these researches have all been conducted with the aid of the apparatus already referred to, by which the dissolved gases have been examined and estimated. It has also been stated that it is only under certain conditions that the products of fermentation are of a simple character and capable of being readily examined. The most important of these conditions is the supply of atmospheric oxygen, because the organisms by which the fermentative changes are effected will take up oxygen during the entire course of their operations, and it is therefore necessary that a supply of this gas may be be secured to every part throughout the entire mass of the water containing them. At first sight this might appear to represent a great practical difficulty, but Mr. Adeney has ingeniously devised a simple solution.

It is of course well known that any ordinary pure water contains a certain limited amount of dissolved oxygen; by diluting the samples of polluted water with varying proportions of clean water, Mr. Adeney was able to provide either relatively large or small proportions of dissolved oxygen compared with the quantity of organic matter. He was thus able to form a a scale or table, beginning with a solution of one part of polluted water to ten of pure water, and gradually ascending to a solution of 1 in 100. The estimation of the oxygen which remained at the conclusion of each experiment showed clearly whether the supply had been insufficient, sufficient, or more than sufficient.

In cases where the dilution with clean water was relatively small, and the supply of oxygen comparatively limited, it was found at the conclusion of the experiment that the dissolved oxygen had entirely disappeared. This disappearance continued until a solution of a certain strength was reached, when it was found that a slight trace of oxygen remained, shewing that the quantity consumed was almost exactly equal to the quantity required; while as the solutions were made more and more dilute, a steadily increasing quantity of oxygen was found and estimated at the conclusion of each experiment.

The gradations in the scale are remarkably uniform—they shew that the quantity of oxygen lost is in proportion to the amount of organic matter in the liquid, and they also bear eloquent testimony to the beauty of the apparatus employed, and the care bestowed on the experiments by those engaged upon them.

During bacteriolysis, side by side with the disappearance of the oxygen, we find the production of carbonic acid (CO_2). The quantity of this gas which is formed will depend upon the strength of the solution.

The ammonia was also estimated, and it was then found that bacteriolysis was attended by the formation of small quantities of this gas, while during nitrification it became oxidised into nitric acid, and there was a corresponding decrease.

Time does not permit of anything like a complete explanation of these most interesting experiments and the lessons to be learned from them.

There is one truth which has been made abundantly clear, namely, that healthy bacterial fermentation cannot take place except in the presence of a sufficient quantity of dissolved oxygen.

In the absence of the necessary amount of this gas, the fermentation is of an entirely different character, and it is known as putrefactive fermentation. A change of this kind is accompanied by the formation of sulphuretted hydrogen and other foul smelling gases, whereas if the fermentation be of a healthy character in the presence of oxygen, no such gases are formed and no offensive odour is observable.

It has already been pointed out that there are two stages of this fermentation. The first, namely, bacteriolysis or carbon oxidation takes place comparatively quickly. It must be complete before the second stage can be commenced. This latter process, which has been named nitrification or nitrogen oxidation, proceeds comparatively slowly.

It is at this time that the nitrites and the nitrates begin to form. It has also been stated that the organisms demand a supply of atmospheric oxygen during the entire course of their operations.

Mr. Adeney has shewn that the number of volumes of oxygen required by the organisms for nitrification is slightly more than that which is required for bacteriolysis, but as nitrification proceeds very much more slowly, the liquid will, as a rule, take up atmospheric oxygen from the air more rapidly than the organisms extract it from the liquid.

This is a point of the greatest possible practical importance, and of supreme interest in connection with the purification of our rivers. It amounts to this, that provided we can insure the satisfactory development of the first stage of purification, namely bacteriolysis, at the works, the final steps of the first stage, as well as the whole of the second, may be allowed to complete itself after the liquid has been discharged into the water course, provided the dilution be sufficient. Putrefactive fermentation will not be set up because the river water will yield a sufficient supply of oxygen to enable the organisms to carry out successfully the second stage of purification.

Here then we are brought at once face to face with a complete solution of the sewage problem, provided we can ensure an adequate supply of atmospheric oxygen to the whole body of the liquid under treatment.

It has already been mentioned that Mr. Adeney confined his researches mainly to matters in solution, and it has also been found in the practical application of his methods that far better results can be secured by working on these lines, that is to say when the removal of the suspended matter is as far as possible effected in the first instance, both by sedimentation and precipitation, and the biological treatment is not commenced until a clarified effluent has been obtained. If this course were departed from the quantity of oxygen required for purification would be greatly increased because the organic matter in suspension would have to be dealt with as well as that in solution.

The real practical difficulty of the proposed system of purification consisted in finding a simple means of supplying a sufficient quantity of oxygen to the body of the liquid under treatment. Mr. Adeney however has found, both through his own researches and from those of other scientists, that micro-organisms have the power of reducing certain chemical compounds containing oxygen and utilising the oxygen thus obtained for their own life processes. It has also been made abundantly clear that these organisms will not effect this reduction as long as they can obtain a sufficient supply of dissolved oxygen from the liquid itself; this is a most interesting and valuable fact.

Mr. Adeney was the first chemist who ever suggested that sewage could be purified through the action of micro-organisms, by adding sufficient quantities of nitrate of soda to the liquid.

The amount of evidence which has been accumulated during the last few years as regards the value of this treatment is very considerable; it has been tested on a large and practical scale, with the most encouraging results. The quantity of nitrate of soda required will depend upon the strength of the sewage, but it need never be wasted because the organisms will never use it, if they can do without it. In practice it has been found that the quantities required are so small that the cost of treatment is very moderate indeed.

It is true that it is not always possible to retain the liquid in the tanks until the last stage of the first and the whole of the second stage of purification have been completed, but from what has already been stated it will be seen that nitrification may be allowed to take place in the stream or river itself without the smallest risk of creating a nuisance or otherwise injuring the stream in any way, when the liquid still contains some nitrate of soda.

There are many other interesting points to which attention could be directed, did time permit, such as the appearance in the liquid after the fermentation is complete of small quantities of coloured organic matters perfectly innocuous, because they have passed through the stage of fermentation and resembling in appearance and in chemical character the colouring matters which are found in peaty waters and in cultivated soils, and are the products of the fermentation of organic matter of a vegetable origin.

When the author of this paper commenced practical experiments in sewage purification under the advice of his friend and colleague, Mr. Adeney, clarification was effected mainly by the use of manganate of soda.

The value of compounds of manganese as agents for sewage purification was recognised as early as 1888 by Mr. J. W. Slator, the author of a work on "Sewage Treatment and Utilization." In the chapter on purification, Mr. Slator states that " Soluble salts of manganese are excellent precipitants, not only do they carry down organic substances dissolved as well as suspended, but they destroy certain impurities by transferring to them a continual supply of oxygen from the atmosphere and from the air dissolved in the water."

The objection to the use of these salts of manganese has always been their relatively great cost. Mr. Adeney has surmounted this difficulty, in addition to all the others with which he has been confronted, by utilising the waste products, rich in manganese, of certain iron industries he has been able to produce a precipitant consisting mainly of a sulphate of manganese which contains all the valuable qualities claimed for manganese compounds as sewage precipitants, while at the same time it can be produced at a very cheap rate. Clarification can thus be accomplished under the best conditions, both as regards efficiency and economy.

Still, however, one difficulty remains, which is probably present to the minds of all those who are listening to this paper, for it is the bugbear of the engineers and the chemists, and the weak point in almost all systems of sewage purification, namely, the question of the sludge.

Some of the most modern exponents of biological treatment are trying to persuade the public that under proper conditions there is no sludge.

It has been claimed for some processes, to use popular language, that the organisms eat up all the sludge, and then eat each other up, and that they eventually disappear, leaving scarcely a trace of their existence behind them. A friend of the writer has expressed his regret that before their final disappearance, they could not be induced to drink up all the liquid as well as to eat up the sludge, and then for once and for all the sewage problem would be solved.

The writer confesses himself unable to endorse this opinion, he does not believe, that with average town sewage it is possible to have sewage works without sewage sludge. Of course it may be possible to reduce the quantity of sludge to a minimum, but the day is far distant when it will disappear altogether.

But to return to Mr. Adeney's methods, the value of manganese compounds as precipitants has been dwelt upon, but they possess in addition another remarkable quality which is of the greatest possible practical value in connection with sewage sludge. This sludge when it contains per-oxides of manganese derived from the precipitant is absolutely inodorous. It is relatively small in quantity, and it can be easily air-dried without creating a nuisance even in the hottest weather. This remarkable quality is also due to the action of the micro-organisms.

These organisms have the power of taking the oxygen from the higher oxides of manganese and reducing them to manganous carbonates. These higher oxides act therefore as oxygen carriers for the micro-organisms. These organisms, thus supplied with abundance of oxygen, carry on the process of fermentation in the sludge under the same favourable conditions as they do in the liquid, so that no putrefactive fermentation takes place, no sulphuretted hydrogen is formed, no odours are emitted, and no nuisance is created.

As to the manurial value of the sludge, that remains to be proved, but, while not wishing to exaggerate, the writer is confident that this sludge will be more easily disposed of and command a better price than any natural sewage sludge which has been hitherto produced.

Mr. Adeney's method of sewage purification may be briefly summarised in the following terms: (1) Clarification under the best conditions by the use of a precipitant, at once the most effective and economical at present obtainable; (2) Purification of the clarified liquid in the simplest possible way by supplying it with a sufficient quantity of oxygen through the agency of nitrate of soda; (3) The production of the minimum of sludge, inodorous and incapable of creating a nuisance.

The writer desires, however, to emphasize the scientific value of Mr. Adeney's researches quite apart from the great success which has attended the practical application of his methods.

A flood of light has been by his labours thrown upon the whole subject of bacterial fermentation in polluted waters and the value of any system of sewage purification can be tested by the touchstone of the well-established and fully proved scientific truths, with which the publications abound. It is for this reason that the writer has been bold enough to adopt as the title of his paper "The True Principles of Sewage Purification."

[*For discussion on this paper see page* 576.]

"*The Scientific Basis of Sewage Treatment*," *by* W. J. DIBDIN, F.I.C., F.C.S., and GEORGE THUDICHUM, F.C.S.

The question of sewage purification has now reached a stage at which old ideas are being rapidly replaced by new, based upon the advances which have recently been made in the direction of treatment by natural agencies, concentrated and controlled by art. It must not be considered that the authors, in attempting to formulate the present position, desire it to be thought that they are able to set forth the whole of the factors which are brought into play in the course of the destruction of waste matter; their object is rather to show the broad principles which have been established as the result of no little practice. That, speaking generally, all sewage operations of a successful character must be carried out in accordance with these principles, the authors are convinced; they are, however, fully aware that a large number of questions remain to be solved, before knowledge on the subject can be in any sense complete. It is by following the general lines laid down, and by avoiding those which by many have been hitherto considered as essential, that the complete solution of the problem may be found.

Before dealing with the manner in which purification is to be effected, it will be advisable to consider what it is that has to be done. Sewage is a mixture of a most varying and complex character, of animal and vegetable-derived substances, in different stages of decomposition; and contains also in many cases, besides ordinary mineral salts, considerable quantities of trade refuse matters of both organic and mineral nature. The organic matters derived from excreta are, insoluble remnants of food and soluble albuminous matters, fatty acids, bile decomposition products, coloring matters, fat, sugar, excretin, etc., and substances derived from the destruction of the constituents of urine, including urea, which is the principal product of the metamorphosis in the body of nitrogenised food. Since a healthy man secretes from thirty to forty grammes of urea per diem, this substance may be taken as an example to show what work has to be effected in completely oxidising nitrogenous animal matter; and more especially as urea has long been known to be capable of rapid alteration and decomposition under the influence of a ferment resembling yeast, or those derived from putrefying animal matters, like albumin. Urea CH_4N_2O, is first changed under these circumstances, by the addition of the elements of water, to carbonic acid (CO_2) and ammonia (NH_3). In order to complete the oxidation, the ammonia has to be converted into nitric acid. This change, as is well known, is effected by the action of a micro-organism, or of a series of such; and it is thus established that a typical excretory substance can be entirely destroyed by the aid of fermentative or allied action of minute organisms without any adventitious assistance. That non-nitrogenised substances, such as starch, can, by the life action of micro-organisms, be gradually oxidised and finally converted into carbonic acid and water, is, of course, a matter of common knowledge. The problem therefore resolves itself into the question of how this natural method of oxidation may be best controlled and expedited.

In all methods of sewage purification which have been previously employed, the final oxidation has been effected by the agencies that have been alluded to, although this fact has failed to be generally recognised. The best and most natural system hitherto tried, namely, the application of sewage to land, depends for its success entirely upon the fostering and increase of micro-organisms. But the use of crude sewage upon land leads to great difficulties, and in consequence previous chemical precipitation has been resorted to. It has not been seen that the same agencies which destroy the dissolved impurities could, if given the necessary conditions, equally deal with those in suspension. Hence came all the numerous chemical schemes, with their inevitable accompaniment, sludge. With the clear effluent it was possible to deal, although the process being dependent so much upon local conditions and climatic influences was always uncertain; but the sludge always remained, the *bête noir* of all those concerned in sewage disposal.

In the recognition of the fact that all processes of sewage purification must be made subservient to the requirements of the various micro-organisms, lies the whole secret of success. All sterilizing or antiseptic agents must be strictly excluded; a condition of neutrality or slight alkalinity must be maintained; oxygen, anyhow in the final stages, must be freely supplied; the temperature must be kept above the freezing point of water; and the amount of food must be proportioned to the powers of the organisms.

In the process of completely oxidising effete matters two stages may be recognized in which distinct classes of organisms play their respective parts. The actual identification of these organisms may be left for future discussion, it being sufficient for the present purpose to divide them into those that are able to break down and liquefy solid organic matter, and those that deal with it when in solution. It is not pretended that a clear line of demarcation can be established, although between the extremes of either class there are very distinct and clearly defined functional differences. The first mentioned class may again be divided into two, viz.: those that do their work in the presence of air, and those that thrive in its absence. Both of these are always present in ordinary sewage, and the predominance of one or the other is entirely in the hands of the sewage operator, If, as at Sutton, the first be employed, care is taken that oxygen shall have free access to every part of the culture medium; the beds are frequently entirely emptied to admit the air to every crevice; and the most successful work, hitherto, has been by working and resting intermittently. When, however, the anaërobians are employed, air is rigidly excluded; a fermentative action of a putrefactive character is encouraged, and the process is necessarily continuous. This is the method which has been adopted with such satisfactory results at Exeter. Into the relative merits of these two systems, aërobian and anaërobian, the authors do not propose to inquire; both are based upon scientific principles, both have been highly satisfactory in practice, and both remove, once and for all, the troubles of sludge disposal.

The liquid organic matters are then subjected to the influence of micro-organisms which effect final oxidation, and this part of the process is the same whether the original breaking down of the solids be effected by aërobic or anaërobic means. Whether both processes can be successfully carried out in one operation remains to be shown; it is, however, probable that difficulties may be found, owing to the somewhat different conditions obtaining.

As far as the results of working on these principles are concerned, the authors can confidently state, of their own practical knowledge, that firstly, no previous chemical treatment is required; secondly, no sludge is produced, thereby removing the chief difficulty hitherto met with; and thirdly, the quality of the final effluent can be controlled, admitting as it does, of being brought to any required degree of purity.

It may not be out of place to state here what, in the opinion of the authors, are the conditions which must be fulfilled by an effluent:—

1. It must contain, practically, no solids in suspension.
2. It must not contain in solution a quantity of organic matter sufficient seriously to rob of its oxygen the stream into which it is discharged.
3. The organic matter it contains must be in such a condition as to yield readily to the natural purifying influences exerted upon it.
4. It must not be liable to putrefaction or secondary decomposition.
5. It must contain nothing inimical to microbial growth and

activity; in other words, it must not be sterilized or treated with antiseptics.

6. It must not contain pathogenic organisms.

By many who are wedded by long practice to the old methods, the new departure is naturally viewed with no little suspicion. Having regard to the large number of solutions of the sewage question which have been put from time to time before the public, this attitude need not cause surprise: and, indeed, were it not for the results of experience during the last six years, the authors would probably be the first to advise caution. In fact, this is indeed their present attitude in a large number of cases, as, where factory refuse has to be dealt with, experimental inquiry is by far to be recommended, as without careful study of the conditions obtaining in each case disappointment and failure may result. On the other hand indifference and obstruction to scientific progress are to be condemned.

It has been laid down by the State Board of Massachusetts that the purifying action of the bacteria in a filter depends upon the passage of thin films of water over surfaces in the presence of air. During this process the air dissolved in the water is being continually used up by the life action of the bacteria and will need replacing in order that the supply may be continuous. This re-absorption of air will take place with considerable rapidity when the exhaustion is great, but at a greatly reduced speed as the degree of aeration increases, and it necessarily follows that the rate of work done must be governed by that of the power of the water to re-absorb fresh supplies.

Just as the conditions relating to the supply of air must be under efficient control, so must the quantity of organic matter in the form of sewage be regulated to the requirements of the organisms. Thus the number of times the bacteria beds can be charged with sewage, consistent with good and continuous work, will depend upon the quantity of solid matters in the sewage; as it may be supposed, that when the organisms are present to a maximum extent permissible with good work, their powers for the destruction of these will be limited, and if they are fed beyond that point they will grow beyond the capability of the water to supply them with oxygen, and putrefaction will result.

Of later years it has become a stock expression to refer to the nitrification of the organic nitrogen. If the nitrogen formed the major constituent of the foul matters the reference would be more in order. As, however, the carbon and hydrogen are present to a much larger extent than the nitrogen, it would be far more correct in some respects to refer to them as indicating the extent of the work accomplished, and therefore the older expression *oxidation* is to be preferred, as it applies to each of the three constituents instead of to only one. On the other hand it may be argued that as the nitrogenous matter is the most objectionable and most easily rendered putrid, its destruction is more important, and the nitric acid is the only measure of the extent of the oxidation of the nitrogenous matters.

Briefly put, and without reference to analytical factors, the foregoing may be looked upon as a short resumé of the present position of the question so far as relates to the disposal of the foul matters which render sewage offensive, repugnant to our senses, and dangerous to health; and the authors are confident that it will only be by careful and continuous study of the question on these lines that advance will be made. The moment that the natural agencies around us are interfered with, and force attempted to be used in the shape of antiseptics, heaping vast masses of putrefying sludge together, &c., failure will inevitably dog our footsteps as it has done for so many years past in place after place.

[*For discussion on this paper, see page* 576.]

"*The Purification of Sewage*," *by* SIDNEY BARWISE, M.D. State. Med. (Lond.)

(FELLOW.)

BY sewage is meant the liquid contents of a sewer*; this in its simplest form of village "slop-water" contains the liquid excretions of the inhabitants, the exudations from the human skin, fatty acids from soap, the foul waters from washing dirty linen, and the slops from kitchens containing animal and vegetable refuse. Such slop-water rapidly becomes more offensive, and contrary to what at first sight would seem to be the case, it is quite as strong and as foul as the sewage from a water-closeted town.†

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* By section 4 of the Public Health Act, 1875, a "sewer" is given the meaning of a drain from two or more houses in different curtilages; and by section 13 of the same Act, "sewers" are vested in the Sanitary Authority, who become by section 3 of the Rivers Pollution Prevention Act, responsible for using "the best practicable available means to render harmless the sewage" flowing therefrom.

† *Vide* Report Rivers Pollution Commission: Mersey and Ribble, 1870.

Fresh domestic sewage has very little smell, and is of a light grey colour. Allowed to stand in a glass, a varying amount of solid matter, such as road detritus, will settle to the bottom, while particles of suspended matter, such as filaments of paper, flocculi of animal tissues, and shreds of vegetable matter will be found throughout the mass, and a fatty or soapy scum will float upon the surface. If kept, the liquid will undergo decomposition through the action of putrefactive bacteria. The albuminous matters will be split up, and their sulphur liberated in the form of sulphuretted hydrogen, the gas which gives its characteristic odour to a rotten egg. At the same time, the liquid turns black from the action of this gas on the infinitesimal quantity of iron generally present in sewage.

The first principle in sewage purification is to treat the sewage before it undergoes this decomposition, as the sulphuretted hydrogen must be got rid of before oxidation or nitrification, which we shall see is an essential part of purification, can take place.

It will be seen that sewage is an extremely complex liquid in a state of unstable chemical equilibrium. A gallon of average sewage will contain about 100 grains of solid matter; such solid matter being partly in suspension and partly in solution, somewhat as follows:—

	Grains per gallon.	
1. Solids in suspension:—		
Organic	20	
Mineral	10	
	—	30
2. Solids in solution:—		
Organic	20	
Mineral	50	
	—	70
		100

Upon analysis such a sewage would yield results somewhat as follows:—

ANALYSIS OF AVERAGE RAW SEWAGE.

Parts per 100,000.*

Total Solids.	Suspended Solids.	Common Salt. (Estimated as Chlorine.)	Free Ammonia.	Organic Ammonia.	Nitrogen as Nitrates.
140	40	20	5·0	1·0	Nil.

The object to be attained in purification is the removal of the whole of the suspended solids, and as much of the organic matter in solution as possible. A fair scheme of purification will remove 90 per cent of the organic matter. If this were done to the average sewage, the analysis of which is given above, the organic ammonia in the effluent would be reduced to 0·1 parts per 100,000, the Derbyshire County Council provisional standard of purity.

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* To convert parts per 100,000 to grains per gallon, multiply by 0·7.

Interpretation of the Results of Analysis..—In order to make the process of purification quite clear, it is necessary to briefly explain the significance of the various terms used to express the results of analyses.

Total Solid Matter.—This term explains itself; it is the weight of the solid matter left on evaporating a known quantity of sewage to dryness. It will vary with the solid matter of the water supply of the district, and the nature of its manufactories. It is less in sewage collected in the early morning than in the afternoon.

Chlorine.—The chlorine owes its presence to the common salt, of which it constitutes about 60 per cent. Of itself it is of little importance; its estimation is useful however, in domestic sewage, as an index of its strength. It is not changed by treatment, therefore the chlorine in the effluent is the same as that in the raw sewage.*

Free Ammonia.—This is the carbonate of ammonia and ammonia, resulting from the splitting up of nitrogenous matters in the sewage, such as urea. The free ammonia of sewage in itself is not a serious source of pollution.

The Organic Ammonia.—This term is synonymous with albuminoid ammonia. It is the ammonia derived by chemists by boiling organic matter with permanganate of potash and caustic potash. It is on the whole the most reliable index of the amount of organic or polluting matter present in sewage. The organic ammonia in sewage varies from 0·2 parts to three or even more parts per 100,000. A good sewage effluent should contain less than 0·1 parts, while the presence of 0·01 parts per 100,000 in a drinking water is frequently sufficient to condemn it.

Nitrates.—The suspended organic matter in sewage can be removed by mechanical straining or by precipitation; but the organic matter in solution cannot be *removed:* it has, therefore, to be oxidized; this effect can be produced by the action of living organisms, the nitrifying bacteria. These organisms if supplied with sewage and air convert the ammonia into nitrates. It will be seen that all attempts to "disinfect" sewage should therefore be condemned, as the germicide, if real, is likely to also act injuriously on the nitrifying organisms; for the same reason the introduction into the sewers of trade wastes, containing powerful chemical agents, such as the mineral acids, is to be deprecated.

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* The advertisement of a patented process of purification recently published showed the chlorine in the raw sewage 30 parts per 100,000, and in the effluent 3·9; the real significance of this is, the effluent was that from a sewage one-seventh the strength of the sewage the analysis of which was published.

To show that the quantity of air to be supplied to the nitrifying organisms must be large,. it is sufficient to say that about half the weight of the nitrates produced consists of oxygen.

TWO STAGES IN THE PROCESS OF PURIFICATION.

The purification of sewage may be divided into two stages :—

First: Clarification, or the removal of the suspended matter. This work is at present best done by adding a chemical precipitant, and is then known as *precipitation.*

Second: The oxidation or nitrification of the organic matter in solution by means of nitrifying bacteria. This change is the same however the sewage is treated, whether by irrigation or intermittent filtration, either through land or specially prepared filters of coal, polarite, coke breeze, limestone chippings, or burnt ballast.

There is no doubt that in the near future the suspended matters will be liquefied by liquefying bacteria (bacteriolysis). The whole procedure of bacterial filtration will then consist of two processes of bacterial filtration.. The work to be done by the nitrifying filters will be enormously increased, and the filters will, therefore, have to be made proportionately larger. Where there is an available fall of ten or more feet, this bacteriolysis might be tried instead of precipitation, the cost of precipitants being avoided.

It is a mistake, however, to utilize the anaërobic liquefying bacteria for the purpose of liquefying the sludge, for many of such organisms reduce nitrates and nitrites, and some of them such as the bacterium sulphuricum and others produce sulphuretted hydrogen, which will afterwards have to be oxidised before nitrification can take place. It is for this reason that I believe the Exeter septic tank to be a mistake, I do not say that the sludge cannot be liquefied, but that the liquefying tank must be worked just like an ordinary sewage filter, so that the liquefaction shall be effected by such organisms as the bacillus aërophilus, the bacillus subtilus, the bacillus prodigiosus, and the bacillus termo. I would go further and suggest that fresh cultures of the bacillus subtilis from hay infusions should be added to the sewage.

Upon the author's advice a plant of this description has recently been put down at a large house near Chesterfield.

Perhaps the most successful attempt to deal with the sludge by means of liquefying bacteria is that of Colonel Ducat at Hendon.

The sides of Colonel Ducat's filter are made of open drain pipes so placed that the outer end is 4 inches above the inner, so that the air can blow in but the sewage does not come out. The upper layers of the filter where liquefaction takes place are composed of coarser material, while the finer material is below.

The author had the opportunity of seeing this filter on September 3rd this year. The crude sewage going on to the filter yielded 0·72 parts of albuminoid ammonia in the 100,000, while the filter effluent contained 0·09 parts of albuminoid ammonia, and as much as 2·5 parts of nitrogen as nitrates, the percentage of purification effected was 87·5. The quantity of sewage filtered per square yard of filter was 250 gallons per day of twenty-four hours. The filter was being worked *continuously*, Colonel Ducat's claim being that it is continuously being aërated on all sides.

But apart from these recent experiments on a sewage which I cannot believe is a strong one, the solid matters must as a rule be separated first, and the sewage be purified by two separate processes.

The changes which are effected by these two processes are exemplified in the following analyses of such an average sewage as we have previously considered.

Parts per 100,000.*

	Total Solids.	Suspended Solids.	Chlorine.	Free Ammonia.	Organic Ammonia.	Nitrogen as Nitrates.
Sewage	140	40	12	5·0	1·0	Nil.
After precipitation	105	5	12	4·5	·45	Nil.
Filtered effluent...	100	Nil.	12	1·5	·08	1·5

The most important column is that giving the organic ammonia, as this is *the index of the organic (polluting) matter*. The common salt estimated as *chlorine* remains unchanged, and as a result of filtration the nitrates are produced.

It will be seen that by precipitation nearly all suspended solids are removed, and more than 50 per cent. of the organic matter; and that by filtration the organic ammonia is reduced from ·45 to ·08 parts per 100·000, *the Derbyshire County Council provisional standard of purity for sewage effluents being* 0·1 *parts of organic ammonia per* 100,000.

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* To convert to grains per gallon, multiply by 0·7.

FIRST STAGE OR CLARIFICATION.

With regard to the first part of the process of purification, where there is a good porous soil, precipitation may not be necessary, the solids in suspension being mechanically arrested in the upper layers of the soil. As a rule, however, in my own county, Derbyshire, the nature of the soil is such that it is advisable to remove the suspended solids by precipitation. When precipitation is adopted, only one-third or even one-fourth of the land will be required which would otherwise be necessary.

The simplest precipitant to use for ordinary domestic sewage is Spence's alumino-ferric blocks. All that is necessary is to suspend a cage containing a block of this substance in the sewage, and it gradually dissolves, precipitating the fatty and albuminous matter to the bottom of the tanks as sludge.

With regard to the form of tank, the author has consistently advocated the conical bottomed tank, first used at Dortmund in Germany, and subsequently adopted at the Chicago Exhibition. Modifications of this tank can be seen at Alfreton and Ilkeston. The advantage of the conical bottom is, that it permits the sludge which falls to the apex of the cone to be removed without first emptying the tank. With the old fashioned flat-bottomed tanks it was necessary to first draw off the supernatant clarified sewage, and then remove the sludge by manual labour.

As to the size of the tanks, the part above the distributing arms should be capable of holding from one-third to one-fourth of the daily flow.

The author then explained the construction of the Dortmund tank. The sewage first passes over the chemical precipitant, it is then agitated by the bafflers, and passes down the central pipe in the precipitation tank, the distributing arms spread it all over the sectional area of the tank, whereby the velocity is so reduced that the suspended matter is not carried on, and slowly settles below the inlet plane, and gradually down to the bottom of the tank, whence it is removed by a suction or centrifugal pump or pulsometer.

The cost of this part of the process is moderate. One ton of alumino-ferric costs from £2 10s. to £3, and will precipitate about 2,000,000 gallons of sewage; or, if we reckon 20 gallons per head per day, it will precipitate the sewage of a population of 1,000 for 100 days.

By precipitation the suspended matters are removed, but the organic matter *in solution*, nearly 50 per cent. of the whole, has still to be dealt with.

Examples.—The following are analyses of typical results obtained at sewage works in Derbyshire, exemplifying the first stage of purification.

Precipitation with alumino-ferric in conical bottomed tanks.

	Organic Ammonia in parts per 100,000.	
	Raw Sewage.	Tank Effluent.
Ilkeston—Central outfall ...	0·32 ...	0·14
„ Southern outfall ...	0·88 ...	0·36
„ Cotmanhay outfall ...	0·96 ...	0·30

SECOND STAGE OF NITRIFICATION.

The clarified sewage may look clear and innocent, but the soluble polluting organic matter is still there. This matter, as has been pointed out, can be removed by nitrifying bacteria oxidizing it into nitrates. This change is effected by passing alternate layers of air and the clarified sewage through the land, or the specially prepared filters, as the case may be.

The tank effluent must not, however, be acid, or nitrification will not take place. With acid sewages, therefore, lime must be employed as a precipitant, either by itself or in combination with alumino-ferric or copperas.

The simplest method of securing the proper aëration of the filters or land, is to use between the precipitating tank and the filters, an automatic flushing tank, which takes about half an hour to fill, and empties in two or three minutes. The filter is thereby dosed with clarified sewage every half-hour, and if it is so arranged that the filter drains dry in twenty minutes, air is drawn into the interstices of the filter, and remains in contact with the films of moisture covering the particles of the filtering medium for ten minutes out of every half-hour, during which time it gives up the oxygen which is required by the nitrifying bacteria growing on the surface of the particles of the filter. In addition, the filter should have a continuous rest with air in its interstices for at least eight hours out of twenty-four.

The manner of working these *breathing or oxidizing filters* has been thoroughly worked out, and is clearly laid down in the reports of the Massachusetts State Board of Health, and more recently it has been demonstrated by the London County Council at their northern outfall.

Various materials have been suggested for the construction of sewage filters; the two which give the best results are polarite and coal. As the result of many experiments, the author is of opinion that *the size* of the material of the filtering medium is the all important factor. It should not be so small as to permit capillary attraction to take place, otherwise air will not be drawn into the spaces between the particles of the filter, which will become water-logged, and it should not be so large that the sewage is not broken up into thin films. These conditions will be complied with by constructing the filters of material that will pass through a one-quarter of an inch screen, but will stop on a one-sixteenth of an inch mesh. Large aërating layers being constructed every 6 inches. There are in the country enormous supplies of waste coal, burnt ballast from coalpits, ironworks, and potteries, besides crushed stone from quarries, a great deal of which could be adapted for the construction of sewage filters, by selecting the portions which do not weather and crushing them to pass one-eighth of an inch sieve.

Such filters will nitrify from 100 to 250 gallons of clarified sewage per square yard per diem, so that if we reckon the quantity of sewage at 20 gallons per head, a square yard will be necessary for every five or ten persons or every one or two houses. An acre of filter would, therefore, suffice for a town of 25,000 to 50,000 inhabitants. The Local Government Board will not, however, sanction any such scheme unless there is one acre of land to every 2,000 inhabitants.

Where there is a sufficient area of properly constructed filters, and arrangements are made for the partial treatment of the sewage coming through storm overflows, the author is of the opinion that the requirements of the Local Government Board with respect to land filtration, subsequent to the adequate filtration, through a sufficient area of specially prepared filters are unnecessary.

Effluents I have examined from specially constructed coal filters have contained from ·04 to ·08 parts per 100,000 of albuminoid ammonia. Such effluents are fit to be turned into any stream.

The following table shows the amount of land that is necessary for the purification of sewage according to the process adopted.

POPULATION PER ACRE OF LAND.

1. Irrigation without precipitation—
    Stiff clay ... ... 1 acre for every 25 persons.
    Loamy gravel ... ... " " 100 "
2. Intermittent filtration without precipitation—
    Sandy gravel ... 1 acre for every 100 to 300 persons.

3. Irrigation and precipitation—
Clay ... ... 1 acre for every 200 persons.
Loamy Gravel ... „ „ 400 persons.
4. Intermittent filtration and precipitation—
Sandy Gravel... 1 acre for every 500 to 600 persons.
5. Precipitation and filtration through specially prepared filters, *e.g.*, of coal, polarite, coke breeze, burnt ballast, &c., to meet the requirements of the Local Government Board—
1 acre for every 2,000 persons.

The principles involved in these various methods of sewage purification are the same. It is the process which should be adopted wherever there is not a sufficient area of suitable sandy or fine gravelly land to be obtained for about £100 per acre.

The sewage first enters the detritus tank, in which ashes and small stones subside; it then passes through a scum trap, which intercepts the fatty and other light matter. Next it passes through a half inch screen, and then through a quarter inch screen, ridding it of corks, rags, and other gross suspended matter which might interfere with the sludge pump or filters. It then passes through the cage, in which the alumino-ferric is suspended, gradually dissolving it. From here it runs through the mixing race, being stirred up by the bafflers. This race should have a good fall (if possible) so as to cause the chemical to become intimately mixed with the sewage. The treated sewage then passes down the central inlet of the precipitation tank, to the distributing arms, when the velocity is suddenly reduced in proportion to the increased sectional area of the whole tank to its central inlet. As a result of the sudden reduction of the velocity the flocculent matter is not carried on but aggregates in flakes and falls to the bottom of the cone. Each morning the sludge (containing 95 per cent. of water) is pumped into the sludge drying lagoon, and in two or three weeks it dries into a light friable soil, useful as a top dressing and for lightening heavy land. In large schemes the sludge is best pumped by a centrifugal pump worked by a gas or oil engine, the whole operation only taking half an hour a day.

The defœcated or clarified sewage then overflows into the outlet troughs, which are spread across the surface of the tank to keep the upward stream uniform and steady. The tank effluent accumulates in the automatic flushing tank until it is full. This takes place in from half an hour to an hour; it then syphons over, spreading all over the surface of the filter, and covering it to a depth of several inches.

The outlet from the filter is provided with a Penstock valve, by means of which the rate of discharge from the filter is so regulated that the clarified sewage does not run straight through the filter, but soaks through at such a rate that the filter drains dry, and is thus aërated for ten minutes or more before another discharge of the tank effluent takes place. The filters are constructed in triplicate, and used in turn for twelve hours; in this way two filters are always being aërated.

If the fall is not sufficient to permit of the use of an automatic flushing tank, four filters must be constructed and used in turn every six or eight hours, except at night, when a run of twelve hours may be permitted.

It is most important, that when the filters are not being used, the Penstock valve should be opened wide, so as to get as much air as possible into the interstices of the filter. Filters so constructed and worked, are practically everlasting. It may however be necessary to place on the top of the filter two or three inches of sand, which should be raked over weekly. Care must be taken that the clarified sewage is evenly distributed over the filter.

The second stage of purification is now being demonstrated by means of experimental filters at Buxton, with the following results.

	Parts per 100,000.			
	Tank effluent.		**Filtered effluent.**	
	Organic Ammonia.	**Nitrogen as Nitrates.**	**Organic Ammonia.**	**Nitrogen as Nitrates.**
Buxton, Destructor breeze filter	0·23	Nil	0·10	·10
„ Coke breeze filter	0·23	Nil	0·11	·09
„ Coal filter	0·32	Nil	0·05	·42

[*For discussion on this paper, see page* 576.]

“*Filtration of Sewage through Coal,*” *by* Prof. A. Bostock Hill, M.D., D.P.H., F.I.C.

(Fellow.)

The passing of the Local Government Act which brought County Councils into existence, and gave them the power of carrying out the Rivers Pollution Act, has caused considerable stir among those interested in the pollution of our rivers. Many of the County Councils, particularly the Lancashire and Yorkshire Councils, have paid special attention to this subject, and as a consequence, the various methods which can be used for purifying sewage and manufacturing refuse have become matters not only of interest, but of importance.

When the first elementary ideas as to purification of sewage had passed away two schools of thought arose; one advocated the treatment of sewage on land, the other, treatment without land, but by precipitation with various chemical re-agents. Although precipitation when carried out scientifically, and under proper conditions can be relied upon to produce an effluent without smell, and of good appearance at first, we now know that there is no precipitant which will remove any material quantity of the dissolved organic matter in the sewage. The suspended matter can doubtless be completely taken away, but that which is in solution, and is in some respects more noxious than much of the suspended matter, cannot be materially affected. Those who favoured treatment on land no doubt could show that both by the processes of intermittent downward filtration, and by irrigation when carried out on suitable land, and under scientific conditions a good and fairly pure effluent could be produced. The Croydon sewage farm is a case in point. On the other hand the actions which have been taken against various authorities of late years for the pollution of streams and rivers, show that in a large number of instances the purification effected is incomplete and partial. In many places land suitable for the treatment of sewage cannot be obtained, and even when it is to be procured the expense entailed on the community by the purchase of a quantity sufficient for the needs of a large and growing town causes an outcry owing to the excessive cost.

It is hardly to be wondered at then, that ideas for purification by filtration through artificial media should have arisen, and we have now had experience of the results which can be obtained by filtration through media patented and otherwise; and we also now know something of the means which are necessary for success. It was not however until the last few years that filtration through such media as ballast and coke had been shown to be effective in purifying the sewage of towns, and Mr. Dibdin by his experiments has brought prominently before us the valuable results that can be obtained from such filters.

In the summer of last year Mr. Garfield, the manager of the Wolverhampton sewage works, became possessed of the idea to see what effect would be produced by the filtration of sewage through a filter composed of fine coal. The matter was mentioned to Mr. E. W. T. Jones, Public Analyst for that town, and these two gentlemen carried out experiments with filters, in which the medium was coal of different degrees of fineness. The result proved very satisfactory, and when it is remembered that the sewage of Wolverhampton is of such a nature owing to the large amount of chemical refuse contained in it that it is one very difficult to treat, it seemed that if satisfactory results could be obtained in this town, better results might be obtained on the average sewage of other communities.

Experimental filters have been laid down therefore in several other places, and in the case of the City of Lichfield, which is under an injunction for pollution of a brook by the effluent from its sewage farm, I have had the advantage of observing the results obtained on the sewage by this means. Lichfield is a brewery town, and its sewage has an all pervading odour of brewery refuse. It is well known that of all sewages, one containing a large proportion of brewery refuse is the worst to treat, in fact in nearly all towns where brewing is a staple industry, from Burton downwards, injunctions have been obtained owing to pollution being caused, or nuisance produced from the farm. I may add here that in the case of Lichfield the sewage is precipitated in tanks of modern construction and well adapted for the work to be done. It is then passed through land well drained in the usual way, but although much purification is effected the effluent is of such a character that on standing for only a few hours it invariably has an odour of brewery refuse.

If such a sewage as this then could be treated by filtration through an inexpensive medium, and a result obtained which would prevent pollution, and would be far better than that already obtained by the land, here was a great desideratum, and as a result of experiments carried on on a small filter, it would appear that such purification can be attained. The results of tank effluent, land effluent, and effluent from the coal filter taken during the present Spring, are given on p. 559, and they show a result which is undoubtedly satisfactory.

It would appear that the action of coal is different from that of other media hitherto used, in that analysis shows that there is a far greater difference in the amount of oxygen absorbed, before and after filtration, than of organic matter, as shown by the amounts of organic ammonia obtained. The following are the details of the construction of the filter, which have been kindly furnished to me by Mr. Garfield. As far as is known any kind of coal will do, but it should be as clean as possible, and, if necessary, washed. The depth should not be less than five feet when it can be obtained. The first layer of the filter consists of 6 inches of coal, about half-inch cubes in size, over and above the effluent drain pipes. This layer is blinded with a little quarter-inch cube coal. Above this comes a layer of thirty inches of one-eighth-inch cube, and on the top of that a thirty-inch layer of one-sixteenth-inch cubes. The top course is a six-inch layer of coal dust which has passed through a three-sixteenth-inch mesh, the fine dust not being removed as in the other layers. The water to be purified is applied to the filter by means of gutters placed level on the surface of the filter. The rate of filtration has been up to now one million gallons per acre per day, but it is believed that this quantity may be increased. The whole of the coal used, except the bottom six inches of half-inch cube, will pass a three-sixteenth-inch mesh, and is thus so fine that it is almost a waste product at the colliery. As a result of twelve months' working it has been observed that the efficacy of the coal has increased. At first it would appear that the action, which, unlike many other mechanical filters, is considerable, is a chemical one by the coal, because the oxygen absorbed is at once directly affected. Afterwards, however, nitrates are produced in considerable quantity, so that probably there is then a double action, chemical and bacteriological.

The coal appears to have a special power of removing the putrescent organic matter from the sewage. The effluent is particularly bright, and as I have stated, shows a marked diminution in the quantity of oxygen absorbed. It is also perfectly free from odour, and thus gives evidence that the organic matter removed is that portion particularly which is in a state of putrescence. If this were not so we should expect to find an equal degree of purification shown by the quantity of organic ammonia present, but as a matter of fact the purification in this way nearly always appears less than by the amount of oxygen absorbed.

On examining the interior of the filter after a constant use of many months, it has been found to be quite free from odour, and to have nothing but a slight earthy smell. How much longer than twelve months the medium will still be effective is not at present known, but there is reason to believe that its period of usefulness will be considerable, and when it ceases to be effective as a purifier it is at a very small cost replaced by fresh coal, while that from the filter is not wasted, but can be used for the purposes of fuel.

It would appear therefore that in many places where land of a suitable character cannot be obtained, that in coal we have a medium, cheap and effective, which will produce an effluent as good or better than that which may be obtained from land, while in those districts which have hitherto relied on land purification it would appear also that by the putting down of coal filters far greater purification can be obtained, and in a growing community it seems possible by this method of treatment to do away with that constant increase in the area of land required which is such an incubus on the rates of our urban communities.

In conclusion, I must add that a coal filter, like any other filter, or like land, must be used with a due regard to scientific possibilities. All of us here are probably aware of the tendency of sanitary authorities to endeavour to get more work out of a filter or a farm than should be required, having efficiency in view; and a coal filter will not produce the results any more than a sewage farm will produce such results, if the sewage of a thousand people is treated on a filter which was originally laid down for the treatment of the sewage of five hundred. In all parts of the country, I have been struck particularly by the fact that one of the most common causes of failure of the means taken for sewage disposal is the tendency of authorities to cut down the cost of carrying out such treatment. Such experiments have only one end; purification gradually gets less and less until it ceases, and a very much larger expenditure of money is required to rehabilitate the means of purification. Of course it is understood that in dealing with sewage by filters, a preliminary precipitation of suspended matter has taken place, and the better this preliminary purification has been effected, the better the result obtained in the effluent from the filter.

In the working of coal filters up to the present, it has been found best to allow the filter to work for a period of twelve hours and then to give it a similar period of rest. As in all other filters, this rest is absolutely essential, but I have reason to hope that the period of rest may be shortened without any detriment to the efficiency of working of the filter. I submit therefore, that in coal we have a filtering medium, which produces a result far better than that claimed for other media. It is superior to coke breeze or ballast in that it has *at once* a chemical action, and its purifying power is marked from the first day it is used, although a still better result is obtained after a period of two or three months' use. The medium is cheap and easily obtained, and although in the past I have looked upon filtration of sewage, otherwise than through land, as of partial and limited value, I strongly believe that the death knell of the costly sewage farm has been rung, and what is of far more importance from an economic and sanitary sense, the problem of sewage disposal has been at last solved, and the prevention of pollution of our rivers and streams has become not only possible but practicable.

ANALYSES OF EFFLUENT (LICHFIELD).

Parts per 100,000.	March 17th, 1897.		March 24th, 1897.		March 31st, 1897.		April 7th, 1897.	
	Tank.	Filter.	Tank.	Filter.	Tank.	Filter.	Tank.	Filter.
Free Ammonia	0·412	0·400	1·00	0·30	0·75	0·42	0·875	0·40
Alb. Ammonia	0·062	0·030	0·15	0·058	0·12	0·028	0·130	0·036
Chlorine	5·1	12·0	6·0	7·4	6·1	6·5	5·7	6·5
N. as Nitrate	0·44	0·33	......	1·07	......	0·35	......	0·33
O. absd. 4 hrs., 80° F.	0·424	0·131	1·24	0·14	0·676	0·268	0·952	0·202
Total Solids	68	78	70	71	70	70·5	60	64
Odour	Slight.	V. slight.	......	......	......	......	......	......
Appearance	Sl. turbid.	Bright and clear.	Sl. turbid.	F. bright and clear.	Sl. turbid.	Bright and clear.	Sl. turbid.	Bright and clear.

	April 14th, 1897.		April 30th, 1897.		May 8th, 1897.		September 9th, 1897.	
Free Ammonia	1·02	0·431	1·56	0·081	2·371	0·104	0·940	1·016
Alb. Ammonia	0·04	0·025	0·230	0·025	0·342	0·048	0·192	0·072
Chlorine	5·4	5·9	6·9	7·4	7·7	7·7	5·4	32·9
N. as Nitrate	......	0·44	......	0·88	......	1·23		
O. absd. 4 hrs., 80° F.	0·2	0·16	1·08	0·12	1·82	0·2	0·95	0·285
Total Solids	66	68	64	70	69	77	51	118
Odour	......	......	S.S. brewery refuse.	None.	S.S. brewery refuse.	None.	S.S. brewery refuse.	None.
Appearance	Sl. turbid.	F. bright and clear.	Sl. turbid.	Bright and clear.	Sl. turbid.	Bright and clear.	Sl. turbid.	V. Sl. opal.
							New Filter.	

A. BOSTOCK HILL.

WATER ANALYSES (WOLVERHAMPTON).

Parts per 100,000.	January 16th, 1897.		February 4th, 1897.		February 24th, 1897.		March 26th, 1897.	
	Tank.	Filter.	Tank.	Filter.	Tank.	Filter.	Tank.	Filter.
Free Ammonia	4·00	3·00	3·20	2·40	5·10	2·53	5·05	4·03
Alb. Ammonia	0·30	0·26	0·40	0·20	0·34	0·07	0·48	0·11
Chlorine	22·2	20·2	12·6	12·2	......	......	21·2	19·2
N. as Nitrate	0·4	2·2	0·55	0·93	......	......	0·0	0·99
O. absd. 4 hrs., 80° F.	0·94	0·126	1·44	0·196	......	......	3·66	0·55
Total Solids	142	134	118	102	......	......	126	123
Appearance	Sl. turbid.	F. bright and clear.	Sl. turbid.	F. bright and clear.	......	......	Sl. turbid.	Bright.
Odour	......	......	......	......	......	......	Strong	None.

A. BOSTOCK HILL.

WOLVERHAMPTON SEWAGE.

Grains per Gallon.	June 23, 1896.		July 7, 1896.		February 3, 1897.		February 16, 1897.		March 8, 1897.		May 5, 1897.		May 11, 1897.	
	Tank.	Filter.	Tank.	Filter.	Tank.	Filter.	Tank.	Filter.	Tank.	Filter.	Tank.	Filter.	Tank.	Filter.
Free and Saline Amm.	6·229	5·604	lost	4·004	1·867	1·868	3·308	2·338	3·486	2·325	4·012	2·335	4·668	2·912
Organic Amm.	0·456	0·072	0·337	0·098	0·169	0·030	0·218	0·55	0·233	0·056	0·334	0·063	0·366	0·052
O. absd. 4 hrs., 80° F.	3·162	0·238	4·067	0·236	0·974	0·155	1·602	0·223	1·245	0·197	3·361	0·334	5·067	0·281
Nitric Nitrogen	none	none	none	none	0·826	0·875	0·154	0·994	0·154	0·343	none	1·17	none	1·17
Combined Chlorine ...	25·27	23·17	20·58	18·76	8·54	8·33	10·15	10·36	9·73	9·59	13·58	15·40	15·47	15·68
Per cent. Purification on Organic Amm.	...	84·3	...	71·0	...	82·3	...	74·8	...	76·0	...	81·2	...	85·8
Per cent. Purification on Oxygen absd.	...	92·5	...	95·3	...	84·0	...	86·1	...	84·2	...	90·1	...	94·5

E. W. T. JONES.

WOLVERHAMPTON SEWAGE.

Grain per Gallon.	July 14, 1897.		July 26, 1897.		September 6, 1897.	
	Tank.	Filter.	Tank.	Filter.	Tank.	Filter.
Free and Saline Amm.	3·490	0·015	3·794	0·005	1·580	0·350
Organic Amm.	0·221	0·022	0·158	0·023	0·130	0·021
O. absd. 4 hrs., 80° F...	3·000	[1] 0·737 much nitrite.	1·573	0·151	0·758	0·130
Nitric Nitrogen.........	none	2·19	none	2·80	0·21	1·00
Combined Chlorine ...	12·60	15·4	16·38	14·21	6·37	6·72
Per cent. Purification on Organic Amm.	...	90·1	...	85·5	...	83·9
Per cent. Purification on Oxygen absd.	...	75·4	...	90·4	...	82·9

[1] in 5 mins. 0·256

E. W. T. JONES.

[*For discussion on this paper, see page* 576.]

“*A year's experience of the Septic Tank System of Sewage Disposal at Exeter,*” *by* DONALD CAMERON, City Surveyor, Exeter.

THE experience to be detailed in the paper which I have the honour of submitting to you has been obtained with the permanent works at Belle Isle, Exeter.

These works deal with the sewage from those parts of the parishes of St. Leonards and Heavitree served by the St. Leonards Sewer, the total population being about 1,500.

They were designed for a maximum flow of 81,180 gallons per day and supersede the experimental plant which, for sometime previous, had been dealing with a portion of the sewage.

During the drought of last year careful gaugings were made of the flow of the St. Leonards sewer. The daily quantity was found to be 35,000 gallons, the maximum flow taking place at 10.30 in the morning, when it was at the rate of 81,180 gallons per twenty-four hours, or 2·3 times the normal flow.

On the 15th August, 1896, the permanent works were finished, the tank being completed first and filled. After some preliminary experiments, to ascertain the water capacities of the filters, the plant was set to regular work on the 21st August. From the 25th a record of the filter discharges has been kept.

The installation, which embodies several improvements suggested by the previous experiments, consists of one tank 64 ft. 10 ins. long, by 18 ft. wide, by 7 ft. to 7 ft. 9 ins. depth of water (10ft. deep at the grit chambers) and five filters, four of which form the working set, one being held in reserve to permit of each filter in turn having a period of rest.

The sewage flowing into the tank is subjected to no screening whatever; on the contrary, special provision was made for the uninterrupted passage to the tank of the contents of the sewer. To obtain this condition, the pipe to the tank, intercepting the sewage, was made of such a size, and laid at such a gradient, as to convey a quantity of sewage and storm water not exceeding 125,000 gallons a day, thus obviating the necessity for a regulating valve or penstock. The main sewer was cut across to a depth of 8½ in. below its invert, a cement weir being put in the sewer on the downstream side of the cut. The pipe to the tank is led away from the bottom of this cut, 16½ ins. below the crest of the weir.

In the tank, at the inlet end, two grit chambers, 10 ft. deep, are formed, and the inlet pipes are carried half-way down these chambers. The outlet from the tank is by a pipe with a slot cut in its side, extending the full width of the tank, and terminating in a gauge-well outside it. The gauging is done by one of the late Professor James Thomson's V notch gauges.

In speaking of the different stages of the work done, it has been found convenient to call the flow from the tank the "effluent," and the discharge from the filters the "filtrate."

The effluent, after flowing from the gauge-well, passes into a shallow aërating trough, over the sides of which it falls in thin sheets into channels leading to distributing wells. In these wells valves are placed, controlling the flow to the distributing channels on the surface of the filters.

The filters have each an area of 80 square yards, and a depth of 5 ft.; collecting drains are laid on the bottoms of the filters, joining main collectors, the latter terminating in discharging wells. In the case of filters Nos. 1, 2, 4 and 5, the filtrant is broken furnace clinker, and in that of No. 3 broken coke.

Filtration with these filters is not by a continuous flow in and out; but when the filter is receiving its dose of effluent, the outlet valve is shut down, so that the filter gradually fills up, and remains full till the next filter is filled, when it is discharged. This was the method adopted by Mr. Dibdin at Barking.

During the earlier stages of the experiments leading up to the experimental plant, it was evident that an automatic arrangement for filling and discharging the filters was necessary; and the simple arrangement which has made these works independent of manual attention was devised.

As the filter fills, the filtrate from it at the same time rises in its discharging well; from these discharging wells small pipes are led, discharging over two pairs of buckets attached to rocking shafts. To these shafts are also attached the valves which control the flow to and from the filters. The filter which has just filled discharges the one standing full, at the same time shutting the outlet and opening the inlet valve of the filter to be filled, and so on. All the manual attention required is when setting to work the resting filter, involving, say, fifteen minutes' work at intervals of two or three days.

The quantity of sewage dealt with during the 12 months amounts, in round numbers, to 20 million gallons, or an average of nearly 54,000 gallons a day. During the latter half of February the flow was 82,681 gallons a day, during April 73,576, and the first twenty-five days of August nearly 38,000. The quantity dealt with during the year is 371 times the contents of the tank, on the floor of which it would form a depth of 2,848 feet.

The works throughout are constructed of concrete, with a concrete arch over the tank. In the arch are placed air-tight manhole covers and plugged openings for taking samples and for measuring the depth of deposit; and in the body of the tank, an inspection well, in the sides of which are placed glass windows to enable the contents of the tank to be viewed. The only outlet from the tank is by the slotted pipe, which is situated 15 in. below the water level.

On the top of the sewage in the tank a scum is formed, consisting of the floating matter undergoing decomposition. During the winter this scum attained a thickness of from 3 to 4 ins., forming a rugged and coherent layer of considerable toughness, the surface of which was covered with a variety of fungoid growths; but as warmer weather set in it gradually dwindled down, until at the present time there is less than an inch of scum over the surface of the tank.

The heavier suspended matter, consisting chiefly of road grit, settles at the bottom of the tank, together with the insoluble residue from the decomposition of the sewage solids. Careful measurements of this deposit made on the 31st August shew the quantity to be about 66½ cubic yards. The bulk is considerably swollen by the gases which are formed during the decomposition of the organic matter still adhering to the deposit, which would bring the whole mass to the surface were it not that the residue is heavier than water, and sinks again to the bottom as soon as it is sufficiently loosened to allow the escape of the gas. In addition to its own decomposition, the deposit is thus subjected to a continual washing action, by which it is ultimately reduced to an inert and inoffensive ash.

Examination of the deposit in the permanent tank shews its composition to be as follows:—

Moisture	88·14	per cent.
Mineral Matter	7·91	„
Loss on Ignition	3·95	„
	100·00	

The dry solid matter in the tank amounted at the time of examination to about five and a half tons, of which two-thirds are mineral matter, the remaining third being made up of water of hydration, carbonic acid gas, and a little organic matter not as yet decomposed. The flow through the tank up to 31st August having been about twenty and a quarter million gallons, the solid matter in the deposit amounts to 4·3 grains for every gallon which has passed through; adding 0·2 grains for the very small amount of dry solid matter in the scum, we have in the tank 4·5 grains per gallon of flow to that date.

The most exhaustive examination of the sewage, so far as suspended solids are concerned, has been made by Messrs. Dibdin and Thudichum, who found in 13 samples collected over 24-hour periods, in April and June last, an average of 24·5 grains per gallon, 10·0 grains being returned as mineral matter and 14·5 grains as organic. Comparing this figure with the amount of solid matter found in the tank, we find that no less than 20 grains per gallon have disappeared, the organic matter in particular having been almost entirely removed. The net loss of dry solid matter over the whole year amounts to about 26 tons, or 81 per cent. of the whole.

If, instead of destroying the suspended solids by bacterial agency, they had been converted into sludge, there would have been 556½ cubic yards of 90 per cent. sludge to dispose of, the production being estimated at one cubic yard per 1,000 persons per day, the average rate ascertained by Mr. W. Santo Crimp in several cases examined by him.

Thus, the tank does away with the necessity for chemicals and filter-presses or other apparatus for disposing of sludge, and produces an effluent which can be filtered without risk of clogging the filters.

There are, broadly speaking, three ways in which the suspended matter which disappears from the tank is disposed of.

I. The tank effluent, while free from any palpable solid matter, contains a large number of minute dust-like particles distributed through it. These no doubt are the product of the constant interchange between the deposit and the scum, caught in their passage near the slotted pipe. No provision has been made for arresting them; and they are carried to the filter with the effluent. They can, however, be very easily arrested, if it should be found desirable to do so. The portion of the suspended matter arrested by the filter channels has always, when cleaning them, been returned to the tank.

After heavy rain, in addition to the fine particles already referred to, the tank effluent is strongly coloured with earthy matter derived from the roads, which is present in such a finely divided state as to escape settlement in the tank, and even to pass through the filters, imparting its colour to the discharge. Any organic particles which reach the filters appear to be retained by the surface film of vegetable matter which forms on the surface, and there destroyed by an action analogous to that which takes place in the tank; at all events there is not the least sign of clogging in the filters, which are now, after a year's working, as clean as on the day they were started, and to all appearance as fit for their work as they were then.

II. A great part of the carbon and hydrogen present in the organic matter is undoubtedly combined with oxygen, also derived from organic compounds, forming respectively carbonic acid gas and water, which pass out with the effluent.

III. The further portion of carbon and hydrogen liberated by decomposition, in excess of the supply of oxygen available for its oxidation, appears in combination as methane or marsh gas, which, being but sparingly soluble in water, collects in the upper part of the tank. Large quantities of free hydrogen and nitrogen are also liberated, the presence of these elements in the free state shewing that the decomposition of the substances yielding them has been carried to the furthest possible point. No trace of sulphuretted hydrogen is found.

No special provision was made for the removal of the gases formed in the tank, nor has any such been found necessary, as at no time is there any appreciable pressure, the gases apparently diffusing freely through the concrete arch into the soil above.

On lifting the manhole covers there is no smell discernable, unless the nose is brought down close to the opening, and then *only* a hardly appreciable heavy odour. The only smell apparent is found at the gauge well and aërator, where an ammoniacal smell is sometimes found. As yet the amount of deposit and scum in the tank appears in no way to interfere with its efficiency.

The effluent has a slightly milky appearance, and, if it is examined in a test tube in a good light, minute dust like particles are seen distributed through the liquid.

Passing now to the filters, it is easy to demonstrate that their work is not merely a straining action. It is true that any particles in suspension in the effluent are caught on the surface by the film already referred to, but this work is trifling compared with the work done in the body of the filter.

Experiments were made on the filter surfaces by lightly raking the surface after resting, and in other cases by allowing the surface to remain untouched; so far as I could learn from this it would appear that the condition of the surface has no influence on the purification. If the condition of the surface were such as to seriously interfere with the aëration of the filtrant, it is conceivable that the results might not be the same. The difficulty of getting the effluent to spread evenly over a filter surface is probably known to most of you; and while the formation of a film may interfere with the aëration, it at the same time spreads the effluent more uniformly over the filter surface, and to some extent prevents its finding its way through the filtrant in a few places, such as close to the distributing channels, alongside the walls, or where the material is coarser than at other parts.

During dry weather the film allowed to form on the surface separates itself from the filtrant, breaking up into small saucer-like patches, leaving the filtrant surface beautifully bright and clean. On examining the undersides of these patches a few particles of the filtrant may be found adhering. These observations cannot be carried on for any length of time, especially during the growing season, if it is an object to keep the filters looking trim and tidy, as the seeds blown on to the filters soon germinate and grow rapidly, giving the filters a very unkempt appearance.

It has been held by English chemists that the film on the surface of waterworks filters was not the determining cause of these filters beginning to purify, but only a coincidence, the film forming about the same time as the filters become seeded with the purifying organisms. This, in my opinion, is the correct view of the case.

The filtering material employed is so much alike in the case of four out of the five filters as to allow but little range of comparison; but as between the clinker and the coke breeze the results were undoubtedly in favour of the clinker. The difference in the work of Nos. 1, 2, 4 and 5, was very small, and nearly all were equally uniform in their results.

The filtering material was intended to be broken to pass through a half-inch sieve, and be rejected by an eighth; but it was actually made somewhat coarser, a great deal of three-quarter-inch material being put in, while in the bottom of three of the filters still coarser material was used. While the purification effected has been highly satisfactory, I should be inclined to reduce the size of the filtrant.

On digging into these filters and getting something like a section of the material for some depth down, it must have struck anyone who saw it how extraordinarily clean and fresh it is right up to the surface; in fact it would appear almost incredible that between four and five million gallons of sewage had passed through each filter.

These filters have to do their work, not by uniform regular doses, but according to the quantity flowing, so that most of it is done during the day time. In the experimental plant it was uniform work; and but little difference was observed between the first and last parts of the discharge. In the case of some of the permanent filters the first rush in discharging is somewhat less clear than the succeeding flow. Samples for analysis were therefore taken in nearly every instance in instalments at 1, 3, 6, 10 and 20 minutes after the outlet valve opened, these intervals being so chosen as to give equal representation in the sample to equal volumes of the discharge, thus ensuring a true average sample.

The works have at various times during the past twelve months been subjected to the most searching examination by chemists of the highest standing, both on behalf of the Town Council of Exeter and on my own, the first reports being by Drs. Dupré and Rideal. Visitors to the works have freely availed themselves of the opportunity of taking samples for analysis whenever they thought fit to do so. In many cases the results have been published; and in no single instance, so far as I know, has the state of the filtered effluent been otherwise than satisfactory. All the samples shew a large production of oxidised nitrogen, often exceeding 1·0 part per 100,000, which is perhaps the best testimony to the high efficiency of the filters. The filtrate is also rich in dissolved free oxygen, nine samples examined by the City Analyst giving on an average 1·15 cubic inches per gallon. As might be expected in a filtrate having these characteristics, the amount of oxidisable organic matter is very small, the oxygen absorbed from permanganate in four hours at 80° F. being as a *rule* well below 0·5 parts per 100,000.

After the first few months' working the purification effected was quite independent of weather and temperature. A sample taken during the frost of last January, and analysed by Dr. Dupré, shewed nitrogen as nitrates to the extent of 1·577 parts per 100,000, while the oxygen absorbed was only 0·405.

While the main purport of this paper has been to describe what has been done at Exeter, yet, seeing that the sewage which has been dealt with here has been of a purely domestic origin, it may not be out of place to refer briefly to the results obtained with a manufacturing sewage, which has the reputation of being one of the worst in England.

The works at Yeovil, consisting of a tank and three filters, were laid down in the autumn of 1896 to deal experimentally with 15,000 gallons of sewage per day, from a district containing several glove factories, as well as a large brewery, and several slaughter-houses. The fall available being limited, the filters were not so deep as I should have wished. The tank has from the outset done its work very well, producing a fairly clear effluent. The filters also, after settling down to their work, effected a considerable degree of purification; but the filtrate was not at first wholly satisfactory, inasmuch as it was deficient in nitrates, in the absence of which purification cannot be regarded as complete. This result was due in great measure to the coarseness of the filtering material, which was much larger than that at Exeter. Latterly, therefore, a much finer material has been used in a small filter, with the most satisfactory results, nearly the whole of the nitrogen present being converted into nitrates, while the oxygen absorbed has been reduced to about 0·3 parts per 100,000. On keeping the filtrate, either in covered or open vessels, no change is set up. These results show conclusively that a foul manufacturing sewage is completely under control by this system.

These works, which are situated close to a highway and a railway, and in full view of a row of houses within but a few yards of them, have fully confirmed the experience gained at Exeter by the entire absence of anything constituting a nuisance.

The Exeter installation, during its twelve months' work, has been subjected to the severest conditions that sewage works have to contend with, and has proved thoroughly reliable in all respects. The trial has been on a sufficiently large scale to give practical results, and is the outcome of experiment, step by step, leading from smaller to larger plants. It has been shewn that sewage-disposal works can be designed so as practically to take care of themselves, requiring no more attention than a visit two or three days a week to change or alternate the filters, the work of a few minutes, and a day's work every month or six weeks in tidying the filters. Once a year it may be desirable to remove the deposit from the tank: by proper arrangements this can be done by the one man who acts as caretaker. To Local Authorities the saving in annual expenditure thus effected is even more important than a corresponding reduction in the first cost of works. At the same time the initial cost of such works as are herein described is very moderate, being less than is often spent in laying out a sewage farm to serve an equal population.

I am glad of an opportunity to acknowledge the generous support given to me by the City Council of Exeter, who have now, after an exhaustive series of tests, adopted the system for the whole city. The members of the Council felt that the subject was one of national importance, but at the same time recognised that it would be fair neither to themselves nor to the Local Government Board to submit a scheme on new lines without being thoroughly satisfied of its efficiency. This has now been demonstrated beyond all question; and I have every confidence that the larger works will prove as satisfactory as those now in operation, and will save the city the heavy annual outlay which they would otherwise have been forced to incur.

This paper is written in the first person singular; but it might with more propriety be in the first person plural, as I am indebted to the gentlemen associated with me, Messrs. F. J. Commin and A. J. Martin, for bringing the work to a successful issue.

[*For discussion on this paper, see page* 576.]

"*Storm-water in Relation to Sewage Purification*," by E. J. SILCOCK, Assoc.M.Inst.C.E., F.G.S., Borough Engineer, King's Lynn.

THE question of Sewage Purification is one which is very prominently before the Local Authorities in this country at this time, and it is especially so in Lancashire and Yorkshire, as there is in each of these counties a very active Rivers Pollution Prevention Board.

That there is room for improvement in the state of the rivers in the north of England will be readily admitted by anyone, who has seen them, and the author ventures to express the opinion that the establishment of these two River Boards is one of the most useful results yet achieved by the County Councils, and that in no direction will their work have a more marked effect on the health and well-being of the communities under their jurisdiction.

One of the greatest difficulties in connection with the problem of sewage purification is that of dealing with the great fluctuation in the flow of sewage to be dealt with owing to the admission of storm-waters into the sewers, and it is this special feature of the problem to which the author wishes to call attention.

The Mersey and Irwell Joint Board, and the West Riding of Yorkshire Rivers Board, are the first two boards established by county councils for the purpose of enforcing the purification of sewage, and upon their action will depend largely the course adopted by similar boards, which will probably in the near future be established all over the country, and the object of the present paper is to endeavour by eliciting the opinion of members to secure some sort of uniformity in the requirements of Rivers Boards, as to the amount of storm-water which must be dealt with at purification works, or in other words the degree of dilution of crude sewage, beyond which it shall be permissible to discharge through overflows into natural streams.

The importance of the solution of this problem to the towns of this country is almost too apparent to need emphasizing, especially in the large towns where land for purification works is difficult to acquire, but a few figures may be quoted to shew how important it is. The ordinary maximum dry weather flow of sewage per acre of a purely urban district, with an average population of seventy-five persons per acre, consuming 20 gallons of water per head per day, is 20 cubic feet per hour. A rainfall of ¼ inch in 24 hours or approximately $\frac{1}{100}$ inch per hour, will amount to the same discharge as the dry weather flow per acre, assuming that the streets are paved, and that only 50 per cent. of the actual rainfall finds it way into the sewers. In other words a rainfall of $\frac{1}{100}$ inch per hour will double the ordinary dry weather flow. Now a rainfall at the rate of ¼ inch *per hour* is a common occurrence, which would mean multiplying the ordinary sewage flow by 25, and short storms at the rate of ½ inch per hour are not infrequent when the ordinary sewage flow is augmented 50 times.

Now consider what this would mean for a town with a population of 100,000 if the whole of the sewage and rainfall had to be taken to the purification works. The ordinary maximum sewage flow at 20 gallons per head would be at the rate of 4,000,000 per 24 hours, and if the sewage were treated on Mr. Dibdin's principle in filters, 4 acres of filters would be required, but to deal with a rainfall of $\frac{1}{4}$ inch per hour would require 100 acres of filters, and if the sewage had to be pumped it would require 25 engines and pumps each capable of dealing with a dry weather flow to cope with the combined rainfall and sewage.

It is therefore evident that the whole of the rainfall cannot be taken to the purification works and that after a certain degree of dilution has been reached the storm-waters must be discharged into the streams. Now, what is that degree of dilution to be?

It may be argued that the solution of the problem is to be found in adopting the separate system of sewerage, and that if this system is carried out in its entirety the ordinary dry weather flow will never be largely exceeded. To such an argument the question may be put, Where has this ever been done? So far as the author is aware, the separate system has never yet been carried out in its entirety in any town, and the opinion of most Engineers is that it never can be successfully adopted even apart from the question of cost. No doubt much can be done in some towns by utilizing old sewers to carry the surface water from the streets and the fronts of the roofs of houses to the streams, but these only form from $\frac{1}{10}$ to $\frac{1}{5}$ of the whole area to be dealt with, and the back-yards and back-roofs must inevitably drain into the sewage sewer, and thus the latter must be made approximately as large as it would be to deal with the whole volume of rainfall, and the fluctuations in its flow will only be relieved to the extent above indicated.

Take Leeds as an example. It would be impracticable to design a system of rainfall sewers in Leeds without involving an expense approximately equal to that which has already been spent on the combined sewers, and Mr. Hewson, the City Engineer, estimates the cost of such a scheme at one million pounds sterling.

The advocate of the separate system might claim that this would not have been the case if the sewering had been carried out on the duplicate system in the first instance. This contention cannot be for a moment admitted, but even if it were so, the facts as they exist must be dealt with, and not on some hypothetical premises which cannot be found anywhere in England.

Further than this it must be borne in mind that the first washings of the streets have been proved to be equally as foul as ordinary sewage, and consequently, if the separate system is adopted, the discharge during slight rainfalls and the earlier part of heavier falls will pollute the streams as much as the discharge of crude sewage, and the author submits that to be perfect even in theory the rainfall sewers of a separate system should be provided with leaping weirs discharging into the sewage sewers in order to separate the foul street washings from the later discharges of heavy rainfalls. The advocates of the separate system have never yet ventured to suggest this arrangement but to be consistent they should do so.

However, the question of separate *versus* combined sewers does not arise at any rate in any large town which is likely to be dealt with by the Rivers Boards, because, as previously stated, the facts have to be dealt with as they exist, and the system in force in any town will probably have been initiated many years and cannot be altered to suit the method of purification.

It may be said that practically in all towns of any size the pumping plant (if any), the outfall sewers, and the main intercepting sewers to a certain extent are incapable of discharging the whole of the rainfall on the areas they serve, and it is absolutely necessary to relieve them by storm overflows which shall conduct the excess of rainfall to the natural water courses.

This object is effected by various devices, the most common being the ordinary overflow weir which is fixed at such a level that when the water in the sewer rises to a certain point it will overflow the weir and be diverted to a different channel.

A very common arrangement is the leaping weir which permits the ordinary sewage-flow to drop through an opening in the invert of the sewer, but when the velocity of flow is augmented by the admission of storm-water the water leaps across the opening and is carried away.

This form of overflow requires a fairly good gradient in the sewer approaching the leaping weir to give a good result. In order to overcome this difficulty on flat gradients an automatic penstock can be used operated by a float which will close the opening through which the ordinary sewage-flow passes from the overflow chamber and cause the storm water to be discharged through another opening to the overflow culvert. There are several of these automatic overflows in Leeds which were designed by the author when acting as assistant to the present City Engineer, Mr. T. Hewson, M.Inst.C.E. These overflows have been in use several years and are found to work very satisfactorily.

In addition to these methods ordinary hand penstocks and sluices are used which require to be opened or closed by an attendant before they can be of service. The disadvantages of these devices are obvious.

The Local Government Board, the Mersey and Irwell Joint Board and the West Riding of Yorkshire Rivers' Board object to all these forms of overflow except the first named or ordinary overflow weir and insist that the ordinary sewage channel shall be kept open and discharging throughout the storm and that the pumping plant and purification works shall deal with their maximum quantity and only the surplus storm-water shall be allowed to be discharged into the streams.

The reason assigned for taking up this position is said to be that the foulest part of the sewage continues to travel along the lower part of the sewer and that it is only the cream so to speak which must be skimmed off the top and sent to the streams. This sounds very well in theory, but the author submits that it would be very difficult to prove the assumption. He has had ample opportunities of judging, having spent many hours in overflow chambers during heavy rainfalls, in connection with the design and adjustment of overflows, and he is convinced that no such separation of sewage and rainfall takes place and he feels confident that if the engineering advisers of the Boards would personally observe the effect of a heavy rain on the ordinary flow of sewers their views on this point might be considerably modified.

This question of diverting the whole instead of part only of the storm-water is more important than it appears at first sight. In nearly every town there is a more or less extensive area adjoining the streams in which the sewers must of necessity be laid below the flood level of the rivers, and consequently the storm-waters from this area cannot be discharged either wholly or in part into the streams. Now if the whole of the upland waters from above this low zone can be diverted into the streams, the sewers in the low zone are left free to deal with the storm-water actually falling on the low zone, but if on the other hand the upland storm-waters are only diverted in part and the sewers from the uplands continue to flow at their full discharging capacity into the low zone sewers the result is likely to be that flooding will take place in the low zone, to say nothing of increased cost of pumping and purification.

It may be of assistance, in solving this problem of the degree of dilution permissible, to examine the provision made in one of the most recent cases on a large scale dealt with by the Mersey and Irwell Board. The standard of purity required by this Board for effluents is one grain of oxygen per gallon in a 4 hours permanganate test.

From particulars kindly furnished by Mr. J. Corbett, Borough Engineer of Salford, it appears that in designing the new purification works for that town he has made provision for pumping and fully treating about 30,000,000 gallons per day for two or three days together, or about 20,000,000 gallons per day for some weeks. The ordinary sewage flow is about 11,000,000 or 12,000,000 gallons, the population served being about 210,000. The water supply is 4½ to 5 million gallons or say 25 gallons per head of the population, and about half a million gallons of additional water is pumped by manufacturers from wells and discharged into the sewers. The balance, therefore, of half the ordinary sewage flow is subsoil water, and the sewage requires about four grains of oxygen to oxydise the putrescible matter per gallon on arrival at the works.

The provision, therefore, appears to be at the rate of 150 gallons per head on the present population which can be fully treated for a short time before it is necessary to turn the surplus into the river, but the Mersey and Irwell Board require the engines and purification works to be kept at work the whole time during the rainfall at full pressure.

This appears to the author to be an unreasonable requirement, for after the first few minutes of a rainfall the additional water from the streets, yards, roofs, &c., is almost free from putrescible matter, and the sewage and rainfall together must at times largely exceed the proportion of 1 to 5 (*i.e.*, 25 gallons sewage, 25 gallons subsoil water and 100 gallons rain water, total 150 gallons per head), so that the sewage during heavy rainfalls probably approaches if it does not attain the standard of purity required by the Board, and there seems no logical reason why the money of the ratepayers should be expended in pumping and purifying this very dilute sewage up to the full capacity of their works, whilst the remainder which they cannot deal with is allowed to run into the streams.

The point, which seems to have been lost sight of in considering this question of storm-water overflows, is that the discharges from these overflows into the rivers are of very short duration, and that the rivers themselves are certain to have a largely increased flow immediately after the discharges take place by reason of the rain-water from the remainder of the watershed finding its way to the river and producing a freshet, so that it is unnecessary to insist on such a high standard of purity at such times as would be required for the regular every day effluent which is continuously discharged for weeks when the streams are very low.

The provision made in the Stockport Main Drainage by Mr. A. M. Fowler, is equivalent to diluting the dry weather flow of sewage with eight times its own bulk of storm-water, and this proportion of storm-water to sewage was fixed in deference to the views of the representatives of the Manchester Ship Canal Company, the effluent from the works flowing into the river Mersey and thence into the Canal. In this case the requirements of the Canal Company would naturally be higher than would be necessary in the case of a river which has a constant stream of water flowing through it, and in some more recent works in the Counties of Lancashire and Yorkshire provision has been made for dealing with sewage diluted to the extent of 6 to 1 and in other cases 5 to 1.

The provision in all these cases is considerably in excess of that provided in many towns. One case in particular is worthy of note, viz.:—Leicester. The total pumping plant is capable of lifting about 100 gallons per head per twenty-four hours, and the ordinary dry weather flow is at the rate of 35 gallons per head, but by the Leicester Extension Act, 1891, it is provided that the overflow culvert shall come into action when the rainfall increases the volume to be pumped to a quantity exceeding the rate of 60 gallons per head per twenty-four hours of the population draining into the sewers. This the Borough Engineer, Mr. E. G. Mawbey, estimates is equivalent to dealing with rainfall in addition to the sewage proper, falling at the rate of ¼ inch in twenty-four hours on the built area allowing for half the rainfall to reach the sewers. It should be pointed out that the overflow culvert in this case discharges into the river Soar, which is a river with a very small flow during dry weather, so small indeed that it does not at times exceed the ordinary dry weather flow of sewage which is about 6½ million gallons per day.

It will therefore be seen that the conditions under which this system works are very trying and as it has been successful and the proportion of dilution has received Parliamentary sanction the author would submit that this degree of dilution is a reasonable and proper one, and one which might well be generally adopted and that when this degree of dilution is reached it should be permissible to stop all pumping and purification work.

[*This discussion applies to the six preceding papers, by* W. KAYE PARRY, W. J. DIBDIN and G. THUDICHUM, Dr. BARWISE, Prof. A. BOSTOCK HILL, DONALD CAMERON, *and* E. J. SILCOCK.]

THE PRESIDENT (Mr. Lewis Angell, London,) said it must have been very gratifying to the authors of the papers to have such large and attentive audiences. Whatever new suggestions had been put forth, he was sure that all present would be unanimous in passing a vote of thanks to those gentlemen for the trouble they had taken in bringing their views before the Section. He asked the Section to accord the authors of the papers a hearty vote of thanks.

Mr. H. ALFRED ROECHLING (Leicester) expressed his gratitude to the authors of the papers, which, he remarked, had been read by Engineers, Chemists and Medical Men. In the short time allowed for discussion it was impossible to deal adequately with all the papers, as they covered a very wide field and contained a great amount of debatable matter. On one point, however, the authors of the papers were all agreed and that was that if they wanted to purify sewage they must give the bacteria full chance to do their work. Mr. Roechling then traced the history of the question of the decomposition of waste organic matters from Liebig to the present time, distinguishing between decomposition proper or complete oxidation and putrefaction or incomplete oxidation. Mentioning finally the Massachusetts experiments, Mr. Roechling remarked that Mr. Dibdin had continued them and brought them to what he (Mr. Dibdin) believed a final issue. If there was a lesson to be drawn from these experiments it was—in his humble judgment—this, that Nature must be left alone; in the purification of sewage, she must be allowed to do her work in her own appointed manner by her own appointed agents and in her own appointed time. But the natural consequence of this was that the only natural sewage treatment, or as Mr. Dibdin had stated "the most natural" sewage treatment, was the land treatment, and with this all the authors, so far as he had been able to read their papers, agreed. Mr. Roechling then went on to refute the objections that had been raised against sewage farms on the score of some failures, unreliability of results and expense. He did not deny that there had been some very bad failures of sewage farms, but given fair conditions he thought the fault was not with the land but with the management. He instanced the case of the Aldershot sewage farm, which Col. Jones had succeeded in improving, so far as the surface of the land was concerned, in two years to such an extent, that no trace of the former systematic neglect and mismanagement could now be discovered. Unreliability of results he thought was in very large measure likewise due to bad management. Concerning the financial and purification results Mr. Roechling gave some figures obtained from the Berlin sewage farms and said no other treatment could even approach the results obtained from the land. Incidentally he referred to the favourable subsoil at Berlin, and stated that we too in this country had some well known sewage farms on very suitable soil, but that besides the soil the management was of the utmost importance. The labour on the Berlin farms was partly done by what he would like to call "Correctionists," *i.e.*, by men, who had been brought before a Magistrate for acts of vagrancy and begging and instead of being sent to prison to do a short sentence had been ordered by him to be handed over to a House of Correction, which had sent some to do work on the Berlin farms. Instead of being outcasts on return from prison these men were trained in regular work and on leaving the farms had some portion of their earnings handed over to them to start them properly in life again. This was evidently a highly philanthropic aim! The authorities preferred as far as the quality of the work was concerned free labour to this class of labour, as one could well imagine, and a day's work done by Correctionists probably cost 3s. 9d. Mr. Roechling then went on to show, that there might be occasions, when the treatment on land could not be adopted for various reasons and he hoped that in such a case the biological treatment might be employed. He felt, however, that with regard to this they required further experiments on a more extended and more varied scale. Amongst other things they wanted to know, whether it was really necessary to employ anaërobic forms, where the aërobic ones had proved quite equal to their task. They wanted further information as to the cost of the works, the nature of the filtering material, the working of the filters, etc., and he hoped the Local Government Board would afford all facilities for such further experiments, so that they might be enabled to form some definite opinion as to the value of the biological treatment.

Councillor G. F. **Baker**, J.P. (Maidstone), gave his experience in visiting some of the works which had been described by readers of the papers. In going to see the Exeter works he was accompanied by the Medical Officer of Health of Maidstone; and he confessed that they went thither with some prejudice against the system which Mr. Cameron had adopted. They came away, however, with the conviction that the works did all that was claimed for them by their promoters. They were astonished to find the exceedingly small quantity of sludge, whilst the effluent was bright and sparkling. The analysis was as Mr. Cameron had described it. If those works could be carried out on a sufficiently large scale, and the Local Government Board would approve of the required loan, they would all, he believed, have cause to be grateful to the City of Exeter and to Mr. Cameron for showing the way to sewage purification. They were conducted over the works at Sutton by Mr. Dibdin and found them equally satisfactory. A good many years ago the Chairman superintended the construction of sewage works at Maidstone. Those had worked well, and as a result the death rate had been very considerably reduced. The Local Government Board would not grant authority to obtain a loan, and they were now starting experimental works to see whether the sewage of the town could be treated by the system of Mr. Dibdin. The speech of the eminent gentleman who had just sat down had been, to some extent, "Made in Germany." He (Mr. Roechling) went very much on the lines of the Local Government Board, which would not grant them anything unless they would carry out its pet fad. In some cases it was not possible to get land, and towns so situated ought to be grateful to Scientists for systems of purification which would enable them to achieve the desired object without overwhelming cost to the Ratepayers.

Alderman **Compston** (Rawtenstall) said that many of them desired to go away from the Congress with something to guide them as to what should be done in their boroughs, more especially in relation to the disposal of sewage. They were being required by the Local Government Board to acquire acre after acre for sewage works, on a system which, after what had been said that morning, seemed to him doomed. The costliness of land filtration, unless worked on the lines adopted at Berlin, and the difficulty of obtaining sufficient land, were terrible bugbears. Many boroughs were being crippled by having, in compliance with the requirements of the Local Government Board, to find money for sewage works which some of them were certain would not be required five years hence. Could not this Congress bring some pressure to bear on the Local Government Board with the view of making it stay its hand in the matter? His experience of the Local Government Board made him regard it in some things as wooden as any other bench. The large attendance in the section indicated the extensive and intensive interest which was taken in this question. They had had a series of most able papers, and he should like to know whether it would be in order to move that the Committee of the Congress be requested to publish them in book form as early as possible. Speaking for the borough he represented he would say that they were grateful for the help the Congress had been instrumental in rendering them on this very important and difficult subject. He would add that they would go away strengthened in their inclination to withstand the terrible demands of the Local Government Board at a period of transition, and grateful to all who had laboured so long and so earnestly in the work.

Dr. S. Rideal (London) saw that the papers before the meeting proved that there was now a consensus of opinion in favour of the bacterial treatment of sewage when suitable land at a reasonable price was not available. Authors of papers read at the meeting were almost unanimous in favouring a filtration through a specially constructed filter for the final treatment of a sewage effluent, and it did not seem to matter much whether coal, coke-breeze, or other material was selected for the filtering medium. The treatment of the suspended matter and solids in crude sewage was a different problem and preceded that of the nitrification and final oxidation of the effluent in the bacterial filter. Three bacterial schemes for dealing with the solids have been brought to the notice of the section. Mr. Cameron's septic tank in which the liquefaction was obviously secured by anaërobic conditions. Col. Ducat's, in which free access of air in the coarse upper layers of a combined filter was an essential feature; and the Sutton or Dibdin filter in which also access of air was one of the conditions. He had recently published in the "Analyst" a paper dealing with the liquefaction of gelatine and other solid proteids in which he had proved to his own satisfaction that even aërobic organisms like *B. prodigiosus* and *B. Liquefaciens* brought about the conversion of gelatine into soluble proteids, ammonia, peptones and organic bases without absorption of atmospheric oxygen, and he believed whatever form of filter or liquefying process was adopted the first change, viz., the liquefaction of the solid organic compounds, took place without any atmospheric oxygen being required. In the open Sutton and "Ducat" systems although air was present it did not enter into the reactions which brought about these preliminary changes. He still adhered to the views expressed in his paper printed in the journal of the Institute in the spring in which he stated that hydrolysis was the first essential condition of success, and Medical Officers of Health would admit that urine, which formed by far the greater portion of the organic nitrogenous matter in sewage, was rapidly changed by the agency of the *B. Ureæ* into ammonium carbonate by simple absorption of water *without atmospheric oxygen*. In the septic tank, therefore, the anaërobic conditions were certainly secured, but in the other two systems at Hendon and Sutton it might be that these anaërobic hydrolytic changes had already, for the most part, been brought about in the sewers before the sewage reached the filter. The loss of nitrogen which was invariably noticed in careful comparative analyses of treated and untreated sewage in these processes was due, in his opinion, to simultaneous anaërobic and aërobic changes taking place as the ammonia of the former reacted with the nitric and nitrous acids of the latter, resulting in the evolution of oxides of nitrogen and nitrogen gas. This even took place in the septic tank, as the crude sewage contained a certain amount of dissolved oxygen, and air found its way into the tank and the nitrifying and oxidizing organisms were always present. The only other point, which he thought time permitted him to dwell upon, was the method of judging as to the value of the final filtrate after its treatment in the nitrifying filter. He thought that better than any of the Standards hitherto suggested the ratio of the oxidized nitrogen in the form of nitrate and nitrite to the "oxygen consumed" figure was the only safe and rational guide. In the oxidized nitrogen there was, as shown by Mr. Parry from Mr. Adeney's researches, a large amount of available oxygen which could and did burn up and destroy any remaining unoxidized matter that might be present in the filtrate. It would be found in practice that if the amount of nitrogen as nitrates and nitrites exceeded the amount of oxygen required as measured by the permanganate test then under no subsequent conditions would a reversion of the sewage take place so as to cause a nuisance, and such a method of valuing the suitability of an effluent was independent of the size of the stream or the dissolved oxygen it contained. When, and in the majority of cases this was the case, the stream was many times the volume of the sewage and contained dissolved free oxygen, then this free oxygen was utilised instead of the oxygen of the oxidized nitrogen. Under these conditions it was not necessary for the oxidized nitrogen as compared to the "oxygen consumed" figure to be so large. It would be noticed that this suggestion got over the difficulty of fixing a limiting figure to the albuminoid ammonia, a determination which he had on several previous occasions pointed out was not such a valuable indication as to the purity or otherwise of a sewage effluent as many experts imagined.

Mr. W. J. Dibdin (London) hoped he would not be misunderstood. He had simply attempted to work on scientific lines in certain directions, and if others chose to work on those lines they were quite open to do so. They might call the system what they would, but he asked them not to call any particular system "Dibdin's," because he had nothing to do with any system except in the way of scientific investigation, carried on in the interests of sanitation.

Dr. Sims Woodhead (London) said there were one or two points which should be very clearly grasped in connection with the bacteriological action of these filters. He fully agreed with almost every statement that had been brought forward by those who had been working with them. A most important fact was made evident from all that had been brought before them that morning: *i.e.*, the growth of bacteria and the disintegration of sewage went on most readily after there had been a thorough turning up amongst the sewage molecules. As they knew, Pasteur had insisted very strongly that the anaërobic changes were in a certain sense more active and led to more violent re-arrangements than the aërobic process. Thus although he believed that the decomposition of the solid sewage could be carried on by aërobic organisms, whether taking oxygen from the air or from nitrates, the preliminary revoluntionary work was done more rapidly by anaërobic organisms. Then another point. They were coming, he was afraid, to look upon those filters as going to completely oust all other processes. He did not think, himself, that these filters could ever absolutely take the place of the river or the sewage farm, because, there was not a doubt that the disintegration of sewage could often be economically carried on with more or less rapidity in the flowing river or on the sewage farm. But this he did believe, where they had a sewage farm or river into which they could turn the effluent, they would gain enormously by subjecting their sewage to preliminary treatment in a biological filter. There they could carry on the first steps and break down and bring into solution organic matter that was afterwards to be further simplified. That must be borne very carefully in mind. He thought they might look forward to the time when these filters might, under certain conditions, do the whole of the work of disintegration and mineralisation. But where they had a tidal estuary or a river with a large oxygen content, into which they could throw their sewage, why should they not utilise it to carry on economically the work they had begun in the filter, especially if it could be done without danger to the community? If there is waste land in a locality also, why not use the treated sewage to make the land more valuable? There was a quantity of material in sewage that might be of very great value to certain localities; they would gain enormously from these filters from this point of view. The great difficulty with sewage farming as they all knew had been the sickening of the land, which was nothing more than the clogging of the soil with more or less solid organic matter. With all the organic matter thrown into solution, however, we have a splendid liquid manure, with nothing to be left behind to sicken the land. In view of the enormous outlay contemplated by a large number of communities would it not be wise to try these filters under different conditions, *i.e.*, with different chemical and trade wastes, and in different parts of the country; the cost would be a mere trifle compared with the sums to be considered in the interests involved. The results, even if only partially satisfactory, and we have now got beyond that stage, would greatly relieve Sanitary Authorities. At Manchester they did not know what to do with their sewage. They were confronted with the objections of Liverpool if they tried to discharge it into the Mersey, even outside the boundaries of the Mersey Rivers Board. He suggested that Manchester (and he made a present of this suggestion) should continue their series of experiments with filters, so as to throw into solution the solid matters in their sewage, and should then run the fluid into the Ship Canal; first of all, however, passing it over some part of that mass. He believed that in some such scheme they would have a solution of this sewage problem. As regards the sludge difficulty, he believed that Mr. Cameron and others working on the same lines had practically solved this question. If there was deposited a mass of only five tons of really solid matter in the course of a year they had at once a solution of the difficulty; there was certainly no need for chemical treatment. He was not going into the bacteriological question. At present he was not satisfied on the point as to which were the best organisms to utilise. Generally speaking they must have peptonising organisms, and this they did know, that the sewage itself brought the organisms that were necessary. It was only necessary to throw the sewage on the filter for a short time and let it rest, leaving the organisms time to grow. Ultimately, when this process was repeated sufficiently frequently, the filter attained to what we might call a ripe condition, the organisms becoming sufficiently active and numerous to do the work required of them. In the tanks they had a condition favourable to the development of anaërobic organisms, or, organisms that could live anaërobically, and, therefore, the anaërobic processes here appeared to be in the ascendent. He thought Mr. Cameron had given a name to his system that was rather apt to frighten people, when he called it a "septic" tank system. He thought, however, that these tanks would come into use, because they gave them conditions under which action anaërobic process could be carried out with success.

Lieut.-Col. A. S. Jones, V.C. (Finchampstead), said he was delighted with the present revival of interest in sewage treatment, and any means of throwing new light upon the subject was very welcome to him. He watched all experiments and scientific laboratory developments of the subject with great interest. He only felt that they must not be too sanguine as to the results laid before them that day. He knew the difficulties attending the *practical* application of scientific truths. When the scientific aspect of the question was discussed upon laboratory or small experiments their enthusiasm was rather apt to overleap the difficulties of practical application. The new treatment recommended by Mr. Dibdin was merely that which was carried out on land in the way of intermittent downward filtration, and was developed by the late Mr. Bailey-Denton on the recommendation of Prof. Frankland. It had been applied at Merthyr Tydfil, where every condition of the modern "Bacteria Bed" was insisted upon with the utmost strictness by Mr. Bailey-Denton, and carried on at Merthyr with good and practical results. He there increased the amount of sewage that could be put on an acre of land from the usual idea of 100 persons per acre to 3,000. Now Mr. Dibdin estimated that by careful treatment and attendance they might raise the ratio to perhaps to 30,000 persons per acre upon his "Bacteria Beds";

Mr. DIBDIN: A million gallons per acre.

and the only difference between those and Bailey Denton's Filter beds consists in the use of a valve to close the outflow of under-drainage for an hour or two during each intermittent application of sewage. With regard to Mr. Cameron's paper, Colonel Jones recognised the old cesspool which had liquefied sewage for many generations, and it seemed they were going to introduce the system their forefathers worked with, but they had found out the reason why the old cesspool worked, and it was the anaërobic microbe. There was no need to give it a new name and delude people into believing they were introducing something new. The anaërobic process had worked for years and years in common cesspools. He thought the term septic tank had caused some delusion and confusion in the public mind.

Mr. T. A. SHEGOG (Newport, Mon.) said they were very fortunate in getting, that morning, no fewer than three complete solutions of the sewage problem. Three several gentlemen had declared that they had found the true solution of the sewage problem. The question had been before the country for a very long time. With the practical details involved in the carrying out of any system he was not at present concerned, but there was just one point he would like to touch on. In regard to the "septic" system at Exeter, they were told that the first stage of the process, the fermentation, is carried out by the aid of anaërobic organisms. One of the products of the first stage of fermentation, that is carbon-oxidation, was ammonia, and this holds true whether the fermention be aërobic or anaërobic; they would, therefore, expect that in septic tanks the effluent would show an increase of ammonia if it were true that bacterial action was going on. This increase was shown by one chemist who reported on the "septic" system to be about 33 per cent., and that was reasonable, and what one would expect. He turned to other analyses by other chemists, some of eminence, and found that they reported there was a large decrease of ammonia. From these two conflicting analytical results both chemists drew the same conclusion, viz., the existence of bacterial activity in the tank. That such contradictory conclusions were drawn shows the value of Mr. Adeney's researches in supplying a touchstone which would serve as a guide in the interpretation of such analytical results. He should like to know how these conclusions could be reconciled; asking not in carping criticism, but as an enquirer after information.

Mr. E. SHRAPNELL SMITH (Liverpool) offered a suggestion upon one aspect of the treatment of sewage through filtration beds. They had passed over one very important feature. When occasion arose to work the filters intermittently much time was lost. He was himself engaged in a chemical process which necessitated the free admission of air. He did not effect it by microbe-organisms, but by a catalytic agent, namely salts of copper. The processes were somewhat analogous, and he made his suggestion accordingly. There was no reason why they should not add air, and draw air through the filter beds, as he was doing in his chemical process, by means of fans.

Mr. W. G. LARKINS (Dublin) said he was not concerned to enter into the disputes or differences that might arise between the chemists who had expounded their views to the section, neither did he wish to discuss engineering matters, but as one who for some years had been working practically upon the effluents of various towns in the West Riding, he regretted that there had been no expression of opinion on the part of some one in authority in the district as to the dream of Messrs. Dibdin and Thudichum, which, if realised, would annihilate all sludge. He reminded some of the gentlemen who had spoken that the authorities of manufacturing towns had not to deal exclusively with domestic sewage. They had also to deal with sewage that contained the refuse of dye works, which refuse included indigo, logwood and other solid inorganic matters, and he should like to ask Mr. Cameron, or others, who could speak with authority regarding the septic tank, whether a microbe had yet been invented that would eat indigo, logwood or any of those other waste materials which went into the sewers and rendered the sewage what it was. Sludge was an important factor in the sewage disposal of all the manufacturing centres in Yorkshire. Take the Halifax effluent as an example, at its best it is a foul, black, heavy effluent; at its worst occasionally like treacle in consistency, and he did not think that the septic tank would make it odourless and harmless, and do away altogether with the solid particles it contained. The quantity of sludge at Halifax was about one ton per million gallons, after a preliminary mechanical sedimentation. He should like to see the experiment tried of dealing with this by the septic system, and he had no doubt that some neighbouring manufacturing towns would be glad to place three or four million gallons a day at the disposal of the supporters of it if they could be assured no sludge followed the treatment, to enable them to prove their annihilation of sludge. The inevitable large quantity of sludge was a very important matter, and had to be considered when dealing with the sewage of all the West Riding towns. In describing the Exeter tank which received a purely domestic sewage, the quantity of sludge in the bottom of it was carefully noted, but when we came to the Yeovil tank, which was said to contain a large quantity of manufacturing refuse, all reference to sludge was omitted.

Mr. **Wolf Defries** (Thames Ditton), said he did not propose to offer any criticism on the technical details, but to ask the Section to consider whether there was not sufficient evidence in the papers which had been read and in the criticisms which had been offered, that they were in the presence of a subject of extreme complexity, and that the conditions were liable to vary in a manner not to be expressed in a single paper or by a single formula. In these circumstances it was much to be regretted that the observations which had been made and were being made were not conducted under conditions sufficiently uniform to make the results comparable. This state of things, which unfortunately prevailed in other branches of experimental sanitary science, meant that a large part of the work would have to be done over again, and the energy and money which had been expended, though they might not have been actually wasted, would have been of much less use than if the observations had been arranged with a view to the ultimate comparison of the results obtained by the various experimental plants. Accordingly, the most important outcome of the discussion that had taken place appeared to him to be the suggestion of Dr. Woodhead, that this was a matter for a systematic experiment, not necessarily at a large expense, but over a sufficient variety of places and conditions and on a scheme expressly so pre-arranged as to enable results to be compared; and that this could be by far the most effective and economical way to obtain some general constructive data. He did not know sufficient of the question to say whether the time was ripe for such an investigation in regard to sewage treatment; but he felt that if this matter, which was so eminently deserving of it, could be attacked in that manner, and if the Congress Authorities could be induced to press upon the more potent Local Authorities the desirability of so attacking it, they would give the most important assistance possible to the rapid solution of the sewage problem, and establish a precedent for attacking a large number of other questions on which heterogeneous experiment would otherwise be more or less wasted.

Mr. W. K. L. **Armytage** (Yeovil) referring to the question as to the quantity of sludge in the Yeovil tank, said an experimental plant, to test "The Septic Tank" treatment of combined manufacturers' refuse and domestic sewage, had been in operation there for the last twelve months and the amount of sludge deposited on the floor of the tank during this period would average between one and three-quarter to two inches; and this is of a mineral and not of a vegetable character.

A **Member**: What is the nature of the refuse at Yeovil?

Mr. **Armytage**: Fell-mongering, leather staining and dyeing for the manufacture of gloves in every stage, from the raw hide to the finished article, and a fair quantity of brewery refuse.

Mr. **Malcolm Paterson** (Bradford) remarked that Dr. Barwise had mentioned in his paper that there was no patent right in connection with the Dortmund tank, adding that he was glad to hear that statement. He believed that the best example of that tank was at Loughborough. It had been claimed that the Dortmund system, as adopted by another person, had certain patent rights, but the Loughborough Corporation had entirely set at defiance all such claims, and, as an engineer he said that there was no cardinal principle in connection with the Dortmund tank that had in any way been improved upon in the so-called patent adopted. He was glad to learn from Professor Bostock Hill that there was so much benefit to be derived from waste coal. If that were proved in practice it would be a very considerable gain to those engaged in the treatment of sewage. Professor Bostock Hill mentioned that filtration through coal had a marked effect upon a difficult sewage—that at Wolverhampton. If it were found that coal could deal with sewage containing strong acids, which he did not think the septic process could deal with, and produce a marked effect upon them, that would be a notable discovery.

Mr. W. J. **Dibdin** (London) reminded the section that this biological method of treating sewage had gradually been coming to the front. Many people were under the impression that it was only during the last year or two that anything had been known about it, and that all at once old ideas were being abandoned, that something new was being put in their place, and that there was nothing to fortify the position taken up. The question was mooted as far back as 1883. He believed that one of the first men to enunciate the principle of the destruction of sewage matters by organisms was Dr. Sorby, of Sheffield, in the course of some evidence given before the Royal Commission. The matter was taken up and carried on by Dr. Dupré and himself (the speaker), and in the course of a paper he (Mr. Dibdin) read before the Civil Engineers in 1887, he stated that the biological process of treating sewage was the coming one. He was only laughed at for his pains. The work was carried on, however; one opponent after the other had come in; and they had been working the system for six years at Barking and five years at Sutton. Working from effluent up to the sewage they found that the same action could be applied to the whole of the crude matters as to the fine matters in the effluent. They had had that process working at Sutton for twelve months, and Mr. Cameron had practically the same thing at Exeter for over twelve months. Since organic matter had existed it had been continually destroyed by the bacteria, but that had only come to them as a matter of knowledge since they became possessed of more definite information regarding bacteria. It was nothing new; they merely understood now what they were before doing imperfectly, and in the dark. As to the effect of storm water upon the action of a microbial filter, the work of the biological filter bed was the destruction of the organic matter. It was not a question of whether they had more or less water, it was the amount of organic matter that was put on the bed, and if that was not materially increased it mattered not how much storm water was put upon it. They had been able to put three or four times the quantity of storm water on to a bed than the volume of sewage they had put previously. That answered the question entirely. While he very greatly appreciated the scientific investigations of Mr. Adeney—he had done admirable work in relation to the action of the micro-organisms—he (the speaker) was sorry that gentleman had stopped short and favoured a process involving the use of chemicals, which, working it out in *cost*, would come to using the equivalent of 50 grains of lime per gallon. He was not speaking of lime, but of precipitants so used, which, when worked out would equal something like the cost of 50 grains per gallon. If Mr. Adeney had only gone a step further he would have been level with them, and he was certain that gentleman would yet come abreast of them in regard to the bacterial treatment of sewage.

Mr. W. **Kaye Parry** (Dublin), said that as regards Dortmund tanks, in 1891 he constructed tanks on this principle in Ireland, using a series of them and getting the most excellent results. Those tanks had been used in connection with Mr. Adeney's proposals, and for five years his system had been tested by practical work, and the works could be examined to-day for the satisfaction of anyone. Mr. Dibdin had misunderstood him as to the question of cost. They had a very cheap way of producing the precipitant, and the little used rendered the cost very small indeed. They had got beyond the experimental stage and they found the quantities required in practice did not exceed this estimated quantity. As regards the observations of a previous speaker on the subject of the conflicting evidence of the chemists with reference to the inference to be drawn from the increase or decrease in the ammonia in the sewage set on, and after it had passed through the septic tank he (the speaker) had to tell them that in the light of Mr. Adeney's researches the chemist who argued favourably from an increase in the ammonia was right, and the chemist who argued favourably from a decrease was wrong.

Dr. S. **Barwise** (Derby) said the experience at Burton showed that there was a fearful smell as a result of the Septic system. Before they used lime as a precipitant the smell was so strong that a clergyman living five miles from the farm obtained an injunction to restrain them from putting the sewage on to the land after it had undergone the anaërobic process in their flat sewers. When we came to such strong sewage as that of Nuneaton and Burton-on-Trent the process if practicable would have to be considerably modified, otherwise injunctions would be granted to restrain them from putting the foul liquid, the result of the Septic process upon the filters. He quite accepted that at Exeter Sulphuretted Hydrogen was not produced, but with most sewages it would be.

Professor A. **Bostock Hill** (Birmingham) said one point which struck him was the complexity of the sewage problem. When some of them inferred that perhaps the sewage problem was solved they meant that the general principle of sewage disposal was solved rather than that one particular method was the correct one. He thought the suggestion of Dr. Sims Woodhead was valuable—certainly for some particular districts. That gentleman suggested that these biological filters were of great use as preliminaries in treating sewage before putting it on to land, thereby utilizing certain valuable material. In districts such as those in and around Birmingham where the sewage of 700,000 people was treated on an area of land, and for many years the authorities had been endeavouring to put a quart into a pint pot, the bacterial filter would be of the greatest value; the adaptation of it would not come as a substitute for land treatment but as an aid to land treatment. Mr. Roechling attributed the failure of farms to bad management; that was true, but everybody knew that there were places where, owing to the quality of the sewage and the nature of the land, such treatment must of necessity fail. It was in places such as those where the bacterial filter would be of use. Then as to coal, in dealing with the Wolverhampton sewage, he (the speaker) did not say that coal had the power of neutralising or removing acid. After precipitation they could get a clear effluent, an effluent as good as that turned out by land. Wolverhampton was at present under an injunction and sequestration order for pollution of streams into which it sent its sewage. The town had now a large area of land, much of excellent quality, on which it treated its sewage, and yet it did not, on account of the chemical nature of the sewage, turn out an effluent which would not pollute a stream. In fact, far better results were obtained by filtration through coal than by the land, neutralization of acid having been previously effected in each case.

THE PRESIDENT OF THE SECTION (Mr. Lewis Angell, London,) said that when he took the chair he was told that the sewage question was certain to excite fierce discussion, and that, like the microbes, they would eat each other up. The discussion, however, had been conducted with good temper and in an extremely satisfactory manner, and he was sure good results would accrue.

Professor A. BOSTOCK HILL (Birmingham), proposed a vote of thanks to the Chairman, who had ably, courteously and patiently conducted the discussion. The papers which had been read contained much of absorbing interest, a fact upon which the Chairman might congratulate himself.

Letter received from Sir FRANCIS SHARP POWELL, Bart., M.P. (Vice-President):—

ISCHL, AUSTRIA.
Sept. 7th, 1897.

. . . . As the time of our Autumn Congress approaches I must not delay a line of apology and regret for my absence from the meeting in Leeds. I should most gladly have attended had attendance been possible.

I learn from you that the subject of Prevention of Rivers Pollution will probably be discussed. Having been in charge of the Rivers Pollution Bill during some years at the request of the County Council's Association, and with the valuable aid of Dr. Farquharson, I venture to write a few lines.

Public opinion in favour of our Bill is fast growing, and I have good reason to hope that much of the opposition will disappear. I have, I need not say, pressed the matter on the attention of successive Governments. In the present temper of the House of Commons as regards Bills introduced by private members, the Rivers Pollution Prevention Bill cannot be passed by a private member, but much may be effected by pressing forward the measure, doing all that can be done to mature public opinion and urging the Government to take the matter up and pass the Bill, or a Bill like unto it, themselves at an early date.

Meanwhile we have the experience afforded by the administration of the Mersey and the West Riding Acts. Much is being done under both Acts.

The authorities are proceeding with much discretion, and avoid unnecessary irritation in the execution of a difficult duty.

The successful operation of the statutes in such counties as Lancashire and Cheshire, the seats of our largest industrial establishments, is surely a great encouragement and justification for moving in advance by every means at our command.

We shall greatly value any action in favour of our Bill which may be taken by the Congress at Leeds.

The only other point to which I should venture to refer in these lines of apology is that of Vaccination. I am very hopeful that the Government may at length see their way to legislate. A new report issued since Parliament rose, on Calf lymph, may clear away difficulties.

The President was so good as to promise me the immediate publication of the Report, which is probably already known to many members of the Congress, or will at any rate be so known at an early date . . . .

Communication received from C. S. **Beeston**, Ormskirk, who was unable to speak at the meeting:—

I feel sure that most of us would be glad to know the cost of the installation at either Exeter or Yeovil, for Mr. Cameron tells us that "it is less than is often spent in laying-out a sewage farm to serve an equal population." One cannot help feeling that the papers and discussion, short as the latter has been, indicate a *principle* to guide us in solving the sewage problem; viz., by allowing and assisting nature to do its work instead of opposing it, as is too often the case.

It does not, however, follow that this or that "system" is the universal cure. Before we can compare the land treatment with any other, to the detriment of either, both systems must be worked with the same amount of intelligence. But does the average sewage farm receive the same amount of care in the distribution of the sewage over the surface as the artificial filter? Is it applied in so intermittent a manner? In short, are they equally "well managed"? When it can be shown that, "management" and "quality of sewage" being equal, the artificial filter turns out a better effluent than similarly treated natural filters, there will be no question as to which to adopt. There is certainly one point in favour of sewage farms; that your ratepayers always have an asset. But, before adopting any of the many specifics, it behoves a sanitary authority to carefully weigh the evidence. The treatment that may be successful in a district without a manufactory of any kind will not be suitable for the sewage of, say, Bradford or Wolverhampton. I would also like to ask Mr. Dibdin whether the increasing use of antiseptics by every member of the community may not be handicapping the treatment of sewage on land?

CONGRESS AT LEEDS.

SECTION III.

CHEMISTRY, METEOROLOGY, AND GEOLOGY.

PAPERS AND DISCUSSIONS.

"*The Rocks of Yorkshire as a Source of Water Supply*," *by* PERCY F. KENDALL, F.G.S.

WHEN I was invited by our energetic local secretary, Mr. Branson, to read a paper on this subject, I confess I accepted the task with some misgivings. In the first place, I was on the eve of the vacation, and was about to take a much needed summer holiday, whilst in the second place I was somewhat aghast at the magnitude of the subject. Though long interested in the question, yet the following notes are to be regarded mainly as a compilation. I am indebted first and foremost to my friend Mr. C. E. De Rance, whose admirable book on the water supply of England and Wales is so well known; also to the sixth report of the Rivers Pollution Commission; the memoirs of the Geological Survey, especially that on the Jurassic Rocks of Yorkshire, by Mr. Fox Strangways; all these have been largely drawn upon. I have also to make grateful acknowledgment of the assistance which I have received from Mr. F. W. Branson, F.C.S., Mr. Fairley (City Analyst of Leeds), Dr. Richardson (Borough Analyst of Bradford), Mr. James Baynes, Ph.D., F.C.S. (Analyst for the East Riding and the Borough of Hull), and Mr. J. E. Stead, of Middlesboro', who have kindly furnished me with many analyses of water.

THE REGIONS TO BE DEALT WITH.

The region of which I have undertaken to speak is a very large one, with a proportionately great diversity of physical and geological structure. The amount of rainfall also varies from place to place within very wide limits, some portions of the area having a rainfall very near to the minimum for Britain, while, in other parts, the amount rises to 70 inches. The country is divisible for our purposes into three divisions, not coinciding with the political or administrative areas, but according to those factors upon which water supply depends, namely, Physical Structure, Geology, and Rainfall.

1. First there is a Western, or Pennine Region, consisting of a hilly, and in part almost mountainous country, composed of Palæozoic rocks, mainly of Carboniferous age, which extends from the western margin of the county to a little eastwards of Leeds. This is a region of heavy rainfall, the amount ranging from probably 70 inches near Ingleborough, down to 24 inches on the Eastern edge, where it falls away into the plain.

2. Then there is a Median Valley Region, consisting of low grounds occupied by Permian Triassic and Liassic strata, forming a broad strip, running in a general N.N.W. and S.S.E. direction. It includes the Vale of York and the low grounds to the northward of the Cleveland Hills. The rainfall is extremely low, usually below 25 inches.

3. There is also an Eastern Hill Region, consisting of Cretaceous and Oolitic rocks. In the nothern part of the region the harder rocks of the Jurassic series, rise to form the massive block of the Cleveland Hills, while to the southward the Chalk Wolds form a series of lofty, rolling, downs, with rather bolder contours than those which prevail in the Chalk country of the South of England. Holderness and the Vale of Pickering are low lying areas of similar rocks covered, however, with a great thickness of drift deposits. The rainfall varies from 36 inches in the Cleveland Hills down to about 25 inches in the southern part of the Chalk Wolds.

The rocks of the First Region consist of the following:—

THE SILURIAN AND ORDOVICIAN SERIES.

These rocks are exposed on the upthrow side of the Craven faults, *e.g.*, in Crummack Dale, Ribblesdale and at Malham. They have an aggregate thickness in these exposures according to Prof. McKenny Hughes, of 10,000 feet. They consist of shales and grits, but as they are not readily permeable they cannot be regarded as good water-bearing strata. On the other hand, from their character they might furnish an admirable base for a puddle trench for gravitation supply; indeed there is probably no more suitable foundation geologically, in the whole of Yorkshire.

THE CARBONIFEROUS LIMESTONE.

This series, which in the southern part of the Pennine Chain is an unbroken mass of pure limestone, exceeding 2,000 feet in thickness, is in Yorkshire interstratified with shales and sandstone, and these intercalations of mechanical sediments constitute a large proportion of the whole, until the latitude of Settle is reached. They are also subject to remarkable variations of thickness, especially in proximity to the Craven faults, a series of great dislocations sweeping in a wide curve round from the Lune Valley, in the neighbourhood of Kirkby Lonsdale, past Giggleswick Scar—a remarkable feature produced by the fault—Malham, and on through Pateley Bridge. They are, in my opinion, traceable into continuity with the great faults which have contributed to produce the Vale of Pickering. Mr. Tiddeman, of Her Majesty's Geological Survey, has pointed out that the faulting movement was probably in progress during the Carboniferous Period, for he finds that the Carboniferous Limestone on the upthrow side of the fault has a total thickness of 400—800 feet, while on the downthrow side it reaches the surprising maximum of 6,000 feet; and not only so, but its character is markedly different, the northern series consisting of practically pure and unbroken limestone, while on the southern side the series consist largely of shales and black limestones, with occasional knoll-like masses of a whiter limestone very rich in fossils. The outcrops of the Carboniferous Limestone occupy large areas in the mountainous country round Settle, Malham, and generally the deep Pennine Valleys, and from the soluble quality of the limestones it constitutes an admirable catchment, as is well illustrated by the great fissured limestone pavements, and the way in which streams are swallowed up directly they pass from less pervious beds on to the Limestone. As regards the quality of the water obtained from the Limestone, though so largely drawn from a moorland catchment, and therefore charged with powerful solvents, its hardness in the deep wells is not as great as might be expected, ranging in cases reported to the Rivers Pollution Commission from 11 degrees up to 27·9 degrees; but Mr. Fairley has kindly furnished me with an analysis of a limestone water at Ingleton, in which the hardness was only seven degrees. In Yorkshire the limestone is generally free from magnesia, and consequently most of the hardness is temporary. In the Ingleton water just referred to only 2·8 degrees was permanent.

THE YOREDALE SERIES.

The rocks of the Yoredale Series display the same series of modifications that are observable in the Carboniferous Limestone. South of the Craven faults they are very thick, reaching a maximum of about 1,200 feet, and consisting of shales and grits, while on the northern side of these great fractures they consist of alternating thick beds of limestone, sandstone, and shale, whose repetitions upon the sides of the hills produce the terraced appearance so characteristic of

Uredale (or Wensleydale), the region of their typical exposure. Their maximum thickness here is only 900 feet. But little information is available regarding the character of the Yoredale water. It is, however, of interest to note that the famous medicinal waters of Harrogate come from this formation; and as indicating the deep-seated source of the springs of the district, I may mention that Mr. Paul, of Harrogate, has found a difference of 10 degrees Fahrenheit in the temperature of adjacent streams. The Yoredale rocks are probably of greater importance as yielding satisfactory foundations for puddle-trenches for intercepting dams than as actual water-bearing strata.

THE MILLSTONE GRIT.

This series, which attains a thickness, in Yorkshire, of about 4,000 feet, consist essentially of four massive beds of sandstone. These are usually very coarse in grain and often pebbly. Between the beds of sandstone are great shaly layers, but only the lowest and highest of the sandstones can be regarded as absolutely constant. These hard resistant sandstones yield but slowly to atmospheric influences, and we consequently find vast areas of the high moorlands occupied by these rocks. They thus constitute great absorptive areas of readily permeable rock, and may be looked upon as one of the greatest natural reservoirs in the county. The researches of Dr. Sorby into the structure of the Millstone Grit, seem to me to justify the inference that its permeability is greater in the deeper seated than in the more superficial portions. But my observations on the moorlands to the north of Keighley fully confirm the opinion of Mr. De Rance that there is an exceptional tendency in faults traversing these rocks to puddle themselves with a luting of clayey particles derived from the shale lands. This puddling appears to take place with greater readiness the more pumping there is, and therefore in any scheme for obtaining a large water supply from deep wells in the Millstone Grit, careful attention is necessary to this point. The quality of the Millstone Grit water is excellent. It is of great purity and very moderate hardness. Thus at Halifax a well in the Millstone Grit yielded water of only 11·8 degrees, and the water supplying Ilkley Baths is of 8·6 degrees of the Clark scale.

THE COAL MEASURES.

The Coal Measures in Yorkshire attain a computed thickness of 5,000 feet. They consist essentially of shales with the not-to-be-overlooked Coal seams and occasional beds of sandstone. They are very inconstant, thickening, thinning, or perhaps wholly disappearing in an exceedingly capricious fashion. Some of the sandstone beds, however, are very persistent, as for example the Elland Flags which cap many of the ridges round about Leeds. The shales usually yield little water but the sandstones are generally capital water-bearing rocks; the mining engineers are indeed apt to employ adjectives of a much more homely and vigorous character in speaking of them. Mr. De Rance records on the authority of the late Prof. Green, my distinguished predecessor at the Yorkshire College, the case of Wath Main Colliery the shaft of which yielded the astounding quantity of 26 million gallons a day for several months. I, however, cannot help suspecting an accidental introduction of a cypher here. Large numbers of private works in the busy centres of the West Riding draw their water supplies from the Coal Measures, but generally speaking the character of the water is not such as to render it suitable for a public supply. The large quantity of Iron Pyrites in the coal measures imparts to the water chalybeate qualities, and frequently Sulphuretted Hydrogen is also present. In addition to this quality the water is often extremely hard, and in many cases which have come under my notice in Yorkshire, Cheshire, and other neighbouring counties large quantities of Sodium Chloride are found in the pit-water, quantities so large as to dispel the particular suspicions which generally attach to waters containing chlorides. In many collieries the water is brackish and that which is found in some might even be called weak brine. Mr. Fairley has noted a pit-water at Bruntcliffe in which there was actually two ounces of salt to the gallon. There is however a goodly proportion of samples of Coal Measure water which might be characterised as first-rate potable water. The hardness is generally high—ranging up to 120°—though in some cases it is remarkably low, as low as 2° or even less.

I have recently detected a copious efflorescence of Magnesium Sulphate upon the surface of some Coal Measure sandstones in Leeds. I ascribe this to the reaction of our rather sulphureous atmosphere upon a Dolomitic cement in the sandstone, perhaps derived from the Permian beds which at a comparatively recent geological epoch must have extended over this area.

THE PERMIAN ROCKS.

These vary in thickness from about 200 feet to nearly 400 feet. They consist mainly of the well-known Magnesian Limestone, which forms such a conspicuous feature of the

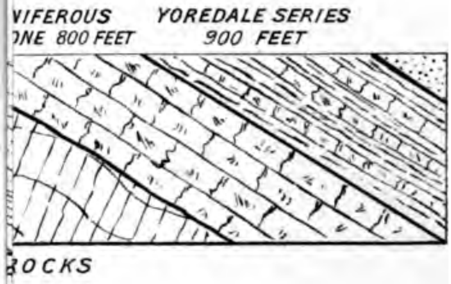
Eastern edge of the Pennine region. Intercalated in the limestones are irregular and somewhat inconstant beds of sandstone and marl. The extreme solubility of these limestones under the attacks of the atmosphere of smoky towns is well known, but even the pure air of the country is not without effect; and this, together with a porosity due to changes belonging to a remote period of the history of the rock, has imparted to the Magnesian Limestone a thirstiness without parallel in our stratified rocks. Where the Magnesian Limestone is exposed without any extensive cover of drift deposits, surface-streams, except such as rise in the Carboniferous rocks beyond, are practically non-existent, but occasionally an intercalated bed of marl will throw out a spring.

Generally speaking the Magnesian Limestone is a good water-bearing stratum, but cases have occurred in which bore-holes have entirely failed to encounter water. Such a one was that put down at Doncaster, in 1867.

The water is very hard, and the famous dropping well at Knaresboro' is considered by Mr. Burrell to be a nearly saturated solution of calcium sulphate, with some magnesium sulphate and calcium carbonate. In other respects the Magnesian Limestone water is very good when taken from deep wells, being remarkably free from organic contamination, but shallow wells may, in consequence of the cavernous and wide-jointed structure of the rock, display a quite exceptional liability to surface pollution.

THE TRIASSIC ROCKS.

The Triassic Rocks consist for our purpose of two divisions, an upper Marl series corresponding with the Saliferous Marls of Worcestershire and Cheshire, and yielding small quantities of water, usually distinctly saline; and a lower series, thin in the north and thicker in the south, of Red Sandstones, which are an invaluable storehouse of good water for the great agricultural populations of this fertile region, and for the market towns which serve them, and Northallerton, Thirsk, York, and Selby, are examples of towns which draw largely upon the Triassic Sandstones for their public or private water supply. The town supply of Selby may be taken as a typical Triassic Sandstone water. A 6½ inch borehole yields a daily supply of a quarter of a million gallons of water of only 8 degrees of hardness. The exposed area of the Triassic Sandstone is extremely small, a heavy cover of Drift—clays, sands, and gravel—occupying the whole of the vale; and indeed were these drift deposits cleared out, the vale of York would be a great marine inlet, a species of fjord, and the Cleveland Hills and Chalk Wolds would be



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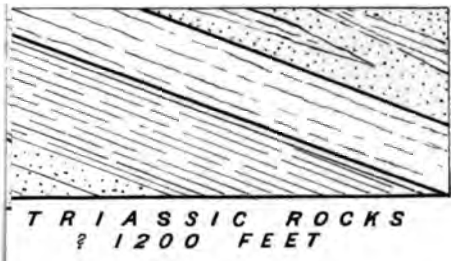

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connected with the mainland—if at all—by a very narrow peninsula. South of the city of York, the Drift deposits are mainly gravel, and it is doubtless through these that the Triassic Sandstones imbibe the water.

THE LIAS

consists essentially of clays, and cannot be reckoned amongst the sources of water supply; but it has its importance as affording a good watertight floor to the important water-bearing strata of the Oolitic series. It forms the picturesque coast and inland scenery of the Whitby district.

THE ROCKS OF THE THIRD REGION.

The Oolites. This great group must be dealt with in some little detail, as its component strata differ markedly in their water-bearing qualities.

The Lower Oolites consist of a great series of Estuarine deposits, mainly sandstone, laid down in the delta of a great river flowing in from the N.E., and consequently they thin towards the south, and the whole Oolitic series is absent in the neighbourhood of Market Weighton. The Lower Oolites may be said to make up the great mass of the Cleveland Hills, a great moorland waste with a heavy rainfall which is greedily absorbed by the porous sandstone, and given out in springs of amazing volume where the base outcrops on the impervious Lias. Such a spring at Grosmont supplies the town of Whitby with excellent water, with only seven degrees of hardness. The Oxford Clay is an impervious bed, above which comes the Corallian Series of sandstones and limestones, forming the remarkable Tabular Hills about Scarborough, and the picturesque moorland country along the north and west and south of the vale of Pickering. These beds, though reaching only a maximum thickness of 370 feet, are of such an exceedingly absorbent nature that they constitute a most valuable source of underground water. Two considerable towns, Scarborough and Malton, may be cited as obtaining their supply from these rocks.

At Scarborough a supply, which for a long time was adequate for the needs of the town, was obtained from a noble spring, which poured out no less than one million gallons of splendid water from these rocks, overlaid by the Kimeridge Clay. The total hardness was 11 degrees. Supplementary supplies are now obtained from two other wells in the same formation, each of which nearly furnish a million gallons. This may be regarded as an ideal water supply.

The Malton supply is obtained from a spring in a similar position to the Scarborough one, and the field of water is large. Its hardness (19 degrees) is, however, a rather serious demerit, and it has been proposed to supplement the supply by tapping a series of springs on the opposite—the southern—side of the town, which will furnish water from another source of rather less hardness.

The Kimeridge and Speeton Clays cannot be regarded as water-bearing strata, and, therefore, call for no special mention.

THE CHALK BEDS.

This magnificent bed of pure white limestone 1,350 in thickness makes up the whole of the hill country known as the Wolds. The rainfall is rather low but nevertheless such is the porosity of the rock that a very large proportion is absorbed and surface streams upon this formation are very few in number and even those are intermittent, many appearing at the surface only during exceptionally wet seasons when they form the Gypsy Races the equivalents of the South Country "bournes." The chalk extends under the whole of Holderness, and when wells are sunk through the cover of drift deposits, they rarely fail to yield copious supplies of water. All the small towns along the Eastern edge by the Wolds are supplied from this source, whilst their great neighbour Hull obtains from deep wells in the chalk, a water supply which having regard to quality and quantity may fairly be described as the finest supply from deep wells in the Kingdom. The water is of excellent quality and though having a total hardness of 16 degrees this can be reduced 2.5 degrees (permanent hardness) by boiling. Immense springs rise along the foot of the Wolds, and if the engineers could overcome the difficulties of conveyance some of the distressed districts in the West Riding could be amply supplied by the county of their fortunate neighbours in the East.

THE DRIFT DEPOSITS.

The Drift Deposits of Yorkshire consist mainly of impermeable clays, with local seams and beds of sand and gravel. They cover a vast area, and in all questions of water supply due regard must be had to their extension. In estimating the water-bearing capacity of a district, attention should always be paid to the limitation of the area of absorption by the impervious cover which these beds afford. Their thickness may amount to 200 feet. As a source of water supply Drift Deposits cannot be recommended, though sometimes large quantities of pure water are obtained by wells and boring-holes in the drift. There is reason to suppose that these supplies have really percolated horizontally from adjacent areas of solid rock. Where this is not the case, and indeed in all cases, drift water must be regarded with suspicion, and only resorted to when other sources of supply are not available. Drift editions of the geological maps are published for the whole of the eastern side of the county, but for the north and west drift maps are not yet available. It is to be hoped, however, that this deficiency will soon be supplied.

The paper was copiously illustrated by diagrams, maps, and lantern slides.

The President of the Section (Mr. Whitaker) thought they would forgive him if he did not cut the discussion of this subject short. They thanked Mr. Kendall for his exceedingly interesting paper—a paper containing much valuable information concerning the Geology of Yorkshire. Had it been announced that the paper would be illustrated there would have been a much larger audience. Mr. Kendall had treated successively every water bearing bed existing in the county. Although he had anathematised the drifts, yet the fact remained that there were places where the drift yielded a fair supply. He concluded by moving a vote of thanks to Mr. Kendall.

Mr. F. Fairley (City Analyst, Leeds) seconded the resolution. He cordially agreed with a great deal of what Mr. Kendall had said with regard to water supplies. There was no doubt that the people of the West Riding preferred soft water such as was obtained from the millstone grit. And with certain limitations the water thus obtained was excellent for manufacturing purposes; the chief objection to soft water was the tendency it had to act upon lead. He only knew, however, of one case of water coming from a spring in millstone grit acting upon lead, and that was water very heavily charged with carbonic acid gas. He had made a number of analyses of water taken from various parts of the county, and he could speak of the exceedingly varied character of the coal measures. Sometimes they got good water from the coal measures, but as a rule it was very indifferent. Another constituent not generally known in the waters from the coal measures was lithium. This was derived probably from lithia-mica, generally to be found in coal measures.

Mr. Richardson (City Analyst, Bradford) spoke of the water in certain strata in his district containing large quantities of carbonate of soda. Some of the large firms in Bradford were desirous of penetrating the deep stratum in order to obtain water without lime and magnesium, but containing a large proportion of carbonate of soda. This furnished them with an alkaline solution. It was a somewhat curious fact that one firm would dig a deep well, and not very far away another enterprising manufacturer would make a deeper boring. Subsequently the first well would lose its supply whilst the second well would obtain it. Very frequently, too, manufacturers would sink wells in the expectation that like their neighbours they would obtain a supply of water full of carbonate of soda, and they would be disappointed to find a totally different kind of water. Could Mr. Kendall give them any geological information concerning this? The paper was one of great value to chemists who took an interest in water supplies.

Mr. W. J. Dibdin (London) supported the resolution, and ventured to think that the paper was one of the most valuable contributed to the Congress as far as regarded the general question of water supplies in Yorkshire. There was one matter he would like to mention in regard to lead poisoning. It was generally supposed that chalk water was free from suspicion. He might mention a case which occurred of water, apparently of exceptional purity, causing lead poisoning. A friend of his residing at Croydon suffering from certain symptoms, and suspecting the water, sent him a sample. That sample contained a large quantity of carbonate of lead. He could not trace it to the new pipes, but whatever the local circumstances might have been, the water was undoubtedly the cause of lead poisoning. Was Mr. Kendall's experience of chalk water in Yorkshire the same as theirs in London as to the water sometimes containing a large quantity of alkali due to admixture with the soft water of the Thanet Sands? It was not uncommon to find sulphuretted hydrogen present in a chalk water, and this had been ascribed to the action of sulphide of iron, which is sometimes found between the Thanet Sand and the chalk. Did Mr. Kendall find a similar condition of things in Yorkshire?

Mr. Reynolds (Leeds) said alkaline waters occurred in Leeds as well as in Bradford. They also were found at Wakefield and Ackworth. He had known instances of sulphuretted hydrogen taking fire on these waters. Such water was of great repute in the South of Leeds, where it was called Holbeck Spa water, and was carried about for making tea. Its softness was recognised as a great merit.

The President of the Section (Mr. W. Whitaker) could not help thinking that there must have been some local peculiarity in the special house service at Croydon. There must have been something in the pipes. That was quite possible in soft chalk water such as that at Croydon. They must always expect the unexpected. It was valuable to hear Mr. Dibdin's experience. They wanted a complete form of chemical analysis. Until this was given they would remain in considerable ignorance as to the nature and constituents of the water.

Mr. **Kendall** said he strongly suspected, in regard to the Croydon case in which carbonate of lead had been found in large quantities, that some other supply of water had previously passed through the old pipes.

Mr. **Dibdin**: Not in this case.

Mr. **Kendall**: I only suggested that that may have been the cause. Continuing, Mr. Kendall said the alkaline waters of Bradford and district appeared to belong to the coal measure formation. The details usually given of wells simply indicated the depth of the wells, sometimes not even that, and it was quite impossible to locate these waters to the particular geological horizon from which they were drawn. It would be of the highest interest if some definite horizon could be fixed from which alkaline waters were taken. With regard to Mr. Fairley's remarks on lithium waters, they were confronted in the millstone grit with a great mass of disintergrated granite. What was the source of this it was hard to conjecture. A careful study of lithology and the nature of rock materials might possibly furnish a clue. There were few towns that were supplied with chalk waters in Yorkshire, and consequently he had not many analyses. In those, however, of which he had analyses he had found no carbonate of soda.

"*A Decade of Sunshine Observations at Leeds*," *by* HENRY CROWTHER, F.R.M.S., and R. REYNOLDS, F.C.S.

TEN years ago the Leeds Philosophical and Literary Society added daily records of sunshine to its meteorological observations. The system selected was that invented by Mr. Jordan, and it has proved satisfactory in the facility with which it is carried out. A strip of paper, prepared by a modified ferrocyanide method, is placed in a dark box having small slits on two opposite sides. The box is fixed facing due south on the top of a building, or some other position commanding a clear horizon. When there is direct sunlight the slit having an eastern aspect admits its ray from sunrise until noon, and the same happens from the western slit from noon until sunset. When the paper is removed a dark blue track is found where the sun's rays have impinged upon it. This track is fixed and made permanent by simply washing off the excess of the sensitive salt with cold water. As the paper is ruled with transverse lines to show the hours and their subdivisions, and only direct sunlight produces the dark track, the measurement of this for the day is easily reckoned.

It was obvious that the area of the city would include localities varying in the amount of sunshine which they enjoyed, and the following three stations were selected for observations, viz.:—

1. The Museum, situate in the centre of the city; elevation above the sea, 145 feet. Observer, Mr. Henry Crowther.
2. Woodhouse Cliff, one-and-a-half miles north-west from the centre of the city; elevation, 330 feet; residential suburb. Observer, Mr. R. Reynolds.
3. Lawnswood Cemetery, Adel, four miles north-west from the centre of the city: elevation, 475 feet; on the fringe of the city. Observer, Mr. C. S. Irvine.

It was soon found that the results from these stations maintained fairly constant proportions, but the science of meteorology demands long-continued observations before giving factors that can be satisfactorily compared.

Table A. gives the hours of bright sunshine registered during the ten years 1887 to 1896.

TABLE A.

YEARS.	MUSEUM.	WOODHOUSE CLIFF.	ADEL.
	H. M.	H. M.	H. M.
1887	1115·03	1325·55	1396·18
1888	720·26	944·59	1021·24
1889	729·35	965·14	1131·44
1890	851·05	1128·50	1242·15
1891	810·55	1002·05	1160·30
1892	978·10	1243·25	1417·10
1893	1223·15	1437·10	1580·35
1894	1174·55	1313·05	1417·00
1895	1530·00	1672·30	1821·30
1896	1007·00	1217·00	1324·05
	10140·24	12250·13	13512·31

Deficiency of Museum from Adel: mean percentage of ten years, 25·4.

Deficiency of Woodhouse Cliff from Adel: mean percentage of ten years, 9·4.

The recording station at Adel has been selected under the belief that the sunshine there is but little obstructed by the smoke of the city, and that Adel consequently represents the type of the normal atmosphere of the locality. Woodhouse Cliff is about halfway between Adel and the Museum, and its records of sunshine are nearly always intermediate between those of the two other stations.

When the observations had been continued for a year or two, they were re-cast, in order to distinguish any differences between the records of Sundays and working-days. These are shown on Table B.

TABLE B.

	Museum.		Woodhouse Cliff.		Adel.	
	Sundays.	Mean of other days.	Sundays.	Mean of other days.	Sundays.	Mean of other days.
	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
1887	172·54	157·01	196·20	188·16	212·08	197·21
1888	135·55	97·25	170·41	129·03	184·40	139·27
1889	97·15	105·23	115·10	141·40	131·07	166·46
1890	164·05	114·30	204·25	154·04	208·55	172·13
1891	128·25	113·45	137·05	144·10	152·25	168·01
1892	181·20	132·48	211·30	171·59	214·50	200·23
1893	209·55	168·53	232·05	200·51	243·00	222·56
1894	167·20	167·56	180·30	188·46	188·50	204·41
1895	262·40	211·13	284·50	231·16	292·10	254·53
1896	173·15	138·57	198·25	169·46	208·55	185·51

Mean percentage for ten years 1887 to 1896:—

	MUSEUM.	WOODHOUSE CLIFF.	ADEL.
Sundays ...	169·1 ...	193·0 ...	203·4
Mean of other days	140·4 ...	171·6 ...	191·1

Deficiency of Museum from Adel: Sundays, 16·8; other days, 26·7.

Deficiency of Woodhouse Cliff from Adel: Sundays, 4·0; other days, 10·5.

It is thus seen that on days other than Sundays the normal sunshine of Adel loses 26·7 per cent. at the Museum, and 10·5 per cent. at the intermediate station of Woodhouse Cliff. On Sundays the loss is less, being 16·8 per cent. at the Museum, and 4·0 per cent. at Woodhouse Cliff. Truly, here is a new reason for calling the first day of the week Sun Day. Some readers of these results will be likely to feel surprise that the practical cessation of manufacturing smoke for about thirty-six hours should not produce a greater improvement in the sunshine of the central station. But, putting aside any preconceived ideas, we must accept the fact that the agencies still operative on Sundays are responsible for 16·8 per cent. of the diminished sunshine. These are, firstly, the natural haze of a valley station with its river, and secondly—and chiefly—the products of the burning of coal for domestic purposes. We shall recognize that the producer of manufacturing smoke has in a large number of cases brought science to his aid in diminishing the amount of unconsumed carbon which he throws into the atmosphere, and that he reaps the reward of this good deed. On the other hand, the householder with his tens of thousands of fireplaces has had little done for him in guidance towards the same laudable object. The use of gas as a fuel for domestic purposes may be extended in the future, and would work for our object. But much is possible in the arrangements for burning coal for domestic use, and Leeds is justly proud of the contribution to solving the problem made by our fellow-citizen, Mr. T. Pridgin Teale, F.R.S., &c., in the fireplaces that bear his name.

It may be of interest that the actual figures for each day of the week should be recorded. This is done in Table C:—

Table C.

Museum.

	Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
1887	172·54	165·31	181·40	136·38	167·02	123·07	168·11
1888	135·55	77·29	115·51	89·04	124·16	92·11	85·40
1889	97·15	117·10	104·15	113·05	106·0	84·45	107·05
1890	164·05	103·50	101·05	122·30	95·25	133·55	130·15
1891	128·25	119·00	96·25	134·20	105·20	120·40	106·45
1892	181·20	146·30	109·00	118·20	124·35	148·50	149·35
1893	209·55	182·40	152·15	183·40	171·50	155.00	168·10
1894	167·20	148·15	162·50	125·0	210·30	162·40	198·20
1895	262·40	219·00	201·00	199·0	185·40	235·50	225·50
1896	173·15	166·30	161·10	115·45	139·05	133·50	117·25
Total	1693·04	1445·55	1385·31	1337·22	1429·43	1390·48	1457·16
Mean	169·18	144·35	138·33	133·44	142·58	139·04	145·44

Woodhouse Cliff.

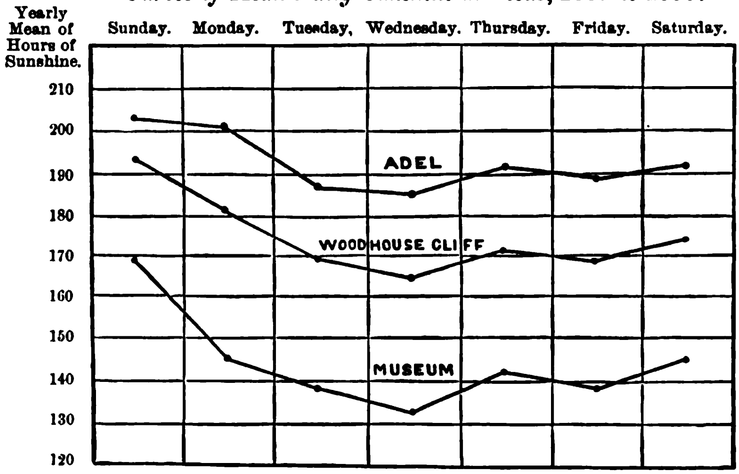
	Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
1887	196·20	191·07	220·35	167·10	197·58	152·42	200·03
1888	170·41	123·51	143·58	122·59	150·44	117·17	115·29
1889	115·10	148·55	135·10	144·52	140·55	130·12	150·00
1890	204·25	148·15	143·30	163·55	128·55	167·55	171·55
1891	137·05	156·30	123·50	154·35	138·10	154·15	137·40
1892	211·30	192·10	143·40	153·45	163·55	192·25	186·00
1893	232·05	216·20	185·05	214·25	197·20	191·30	200·25
1894	180·30	173·50	191·40	143·25	228·50	173·55	220·55
1895	284·50	250·0	226·50	224·10	205·0	251·40	230·00
1896	198·25	205·05	184·35	161·40	161·50	161·40	143·45
Total	1931·01	1806·03	1698·53	1650·56	1713·37	1693·31	1756·12
Mean	193·06	180·36	169·53	165·05	171·21	169·21	175·37

Adel.

	SUN.	MON.	TUES.	WED.	THURS.	FRI.	SAT.
	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
1887	212·08	202·33	219·53	183·36	197·57	172·13	207·58
1888	184·40	134·03	151·37	132·09	159·50	122·03	137·02
1889	131·07	178·25	158·35	171·55	167·50	161·27	162·25
1890	208·55	169·25	173·20	180·35	140·30	180·55	188·35
1891	152·25	182·05	144·20	183·05	159·55	180·35	158·05
1892	214·50	217·35	186·25	183·35	191·25	211·30	211·50
1893	243·00	236·20	197·15	232·40	236·30	210·05	224·45
1894	188·50	181·50	204·00	173·10	247·30	202·40	219·00
1895	292·10	276·30	248·30	243·50	236·00	265 40	258·50
1896	208·55	230·30	198·30	176·50	176·35	186·55	145·50
Total	2037·00	2009·16	1882·25	1861·25	1914·02	1894·03	1914·20
Mean	203·44	200·55	188·14	186·08	191·24	189·24	191·26

Over-refinement in theorising upon these data is needless, but the partial improvement of the central station on Saturdays is clear, as is one on Thursday, probably due to the Wednesday half-holiday of those tradespeople who must attend to their businesses on the Saturday. These improvements are best shown by the following diagram, drawn from the means given on Table C, of "The Curves of Mean Daily Sunshine at Leeds, 1887 to 1896":—

Curves of Mean Daily Sunshine at Leeds, 1887 to 1896.



For better or worse? The records of sunshine already given are the results of more than 10,000 observations, and their interest to many will be prospective rather than retrospective.

By a slow and patient process of collecting present facts we are in possession of data giving a "value" for the atmospheric pollution of ten years. Are we improving or deteriorating? If the same influences operate in the same way, we ought to find that the increase of population and of manufactories during the period would have the effect of making worse what was bad before. The population of Leeds in 1887 may be taken as about 350,000; in 1896 it was assumed to be 400,000.

If our atmosphere holds its own against this increasing stress and strain it is something to the good. In constructing Table D for the purpose of a reply to this question, we have preferred to take for comparison five periods of two years each.

TABLE D.

	Museum.	Woodhouse Cliff.	Adel.
	H. M.	H. M.	H. M.
1887 1888	1835·29	2270·54	2417·42
1889 1890	1580·40	2094·04	2373·59
1891 1892	1789·05	2245·30	2577·40
1893 1894	2398·10	2750·15	2997·35
1895 1896	2537·00	2889·30	3145·35

Deficiency of Museum from Adel:—

1887-88	...	24·0 per cent.
1889-90	...	33·4 "
1891-92	...	30·5 "
1893-94	...	20·0 "
1895-96	...	19·3 "

or a mean deficiency on ten years of 25·4 per cent.

Our answer may be considered satisfactory and encouraging. The last two-year period places the atmosphere of the central station in a better position than any of the four preceding two-year periods, and this has occurred in spite of the steady increase of both population and buildings in the city. Whilst regarding these results as encouraging, we feel that their legitimate application is as a stimulus to further endeavours to attain the blessing of a purer atmosphere.

We hope that the present paper has been successful in showing that a method of sunshine recording, adopted by hundreds of observers throughout Britain, and recognized by the Authorities of the Meteorological Office, as proved by the inclusion of many records by the Jordan instrument in its

Weekly Weather Report, may prove a valuable means of estimating not only the actual, but the relative, pollution by smoke of a town's atmosphere. The method is simple and inexpensive. The records are permanent, and available for confirmation or refutation if needed, and they may be compared with abundant observations in other places. The adoption of a normal station just outside the corrupted atmosphere, and the study of the facts observed in relation to days of greater or smaller activity of manufacturing operations, are the points on which we venture to think that our method has novelty.

It is proper to state that all the sunshine papers when fixed and washed are sent weekly to the central station at the Museum, where their respective values are computed by the same person, and the figures appear in the Weekly Record published in the local newspapers.

[*For discussion on this paper see page* 609.]

"*Air Pollution in Towns*," *by* J. B. COHEN, Ph.D., Lecturer in Organic Chemistry at the Yorkshire College, Leeds.

THE author draws attention to the fact that whereas pure water and wholesome food claim the strictest supervision on the part of every municipal body, the air we breathe—of which the consumption exceeds in weight five times that of liquid or solid food, is subject to no more searching test than that furnished by the daily meteorological record.

From numerous experiments, carried on at different seasons, the author finds that the number of bacteria in the air is a fair test of the sanitary condition of the place.

Another source of pollution of a Town atmosphere is smoke. The author, from a careful study of this subject, details of which have been published elsewhere, finds that about 8 cwt. of soot—being the permanent representation of 20 tons daily discharged into the air—is constantly floating in the atmosphere of Leeds.

Apart from this waste of fuel, the only part of the cost which can be measured in £ s. d. is the extra outlay for washing, which on trustworthy authority may be estimated for Leeds at something like £20,000 annually. The author considers that the amount of the washing bill is an insignificant item compared with the lowered vitality and moral tone of the community. The problems are: how can we purify our atmosphere from bacterial impurity, which arise from overcrowding and insufficient sanitary accommodation, and from smoke which is emitted from factory and domestic chimneys?

These problems are rendered particularly complex, not from any inherent difficulty, but from the fact that long habit and a deplorable want of foresight have shackled them with "vested interests."

The boiler chimneys of factories, which are accountable for much of the smoke, require some more rigid and intelligent system of inspection. It has been demonstrated repeatedly that boiler chimneys need not smoke, and the often-quoted case of Nottingham shows what can be done where the manufacturing interest lies in the suppression of smoke.

The system of municipal smoke inspection does not oblige the Inspector to take account of the conditions under which the manufacturer works, nor to offer official advice as to the best means of removing smoke.

The inspection, the author thinks, should be instituted on the lines of the Alkali Act, by which the Inspector is empowered to advise, and is able to do so from practical experience drawn from a wide field of observation.

The domestic hearth is more difficult to deal with. If gas were charged at a rate more nearly approaching its cost, its consumption for heating purposes would be more general. From a careful study of the subject, published elsewhere, the author feels in a position to state that gas fires judiciously used are thoroughly healthy and efficient heating appliances, although costly at the present price of gas.

The author points out that the least civilized British community, which would be found in some remote country place, is not naturally unclean, and considers that air pollution is largely responsible for the squalid condition of urban habitations among the poorer classes.

[*This discussion applies to papers by* H. Crowther *and* R. Reynolds *and* J. B. Cohen.]

The President of the Section (Mr. W. Whitaker) was sure they would thank the authors for their interesting contributions. They had explained to him why there was sunshine that morning; it was because it was Thursday and we had got to the "upcurve." He was glad to hear a good account of the sun recorder of his old friend Jordan, who was a reliable man. The recording sunshine, however, was a little liable to failure. A very singular instance of this happened at Greenwich Observatory. They found records of sunshine taken in a tolerably open place, away from London smoke, were not so good as those taken by a similar instrument at Bethnal Green, in the middle of the smoky district. The Greenwich people did not like this. Their own records had been taken by means of a glass globe which it was afterwards found had got dull and would not let the sunshine go through properly. They had heard at the Congress something about the need for the purification of the River Aire. If they paid a little attention to the purification of the city air as well it would be a well advised action. He was glad to hear from Mr. Crowther that if the Congress came to Leeds again in ten years they might have a paper on sunshine, and not on the decadence of sunshine.

Mr. **Richardson** (City Analyst of Bradford) said although the first paper was one of exceeding interest, making clear to them matters that seemed to have been somewhat smoky in the times past, yet the second paper by Mr. Cohen touched something of greater and more vital importance. Mr. Cohen was doing a good work in pointing out these facts to emphasise the necessity for pure air. It would be well if proper stations could be established, not merely for estimating the amount of sunshine, but for estimating the number of, and most important of all, the exact nature of the bacteria in the air in different parts of our towns and cities. This would lead to the tracing of diseases to their proper sources. Many diseases were air-borne; there was no doubt that typhoid was often air-borne. It would be of the greatest service if sanitarians were supplied with data in regard to the number and nature of microbes found in different quarters of our great centres of population. If this were done they would be able to trace the causes of many diseases which are now obscure. The soap manufacturers must derive considerable satisfaction from Mr. Cohen's paper on hearing that their business was being indirectly increased by the prevalence of filth in the atmosphere.

Mr. **Walter Rowley** (Leeds) said the outcry that they were hampering and fettering trade was a constant obstacle in the way of sanitarians and municipal authorities remedying the present state of things. Experts who were endeavouring to deal with this question of the purification of the atmosphere and of our rivers and streams had a very important work in hand. He questioned the right of anyone engaged in trade, for any purpose whatever, doing either of these great acts of injustice to the community at large. To plead the requirements of industry was no justification for polluting the air or the stream common to all alike. True, every consideration ought to be shown towards traders, but when the evil was one which could be remedied without causing any serious inconvenience, it was then only a question for the municipal authorities and traders to agree upon the best method of dealing with both these questions upon which the happiness and comfort of the people so greatly depended. These evils ought soon to be things of the past, for where there is a will there is a way; and most certainly science has successfully decided that there is an efficient and economical process available in both cases, such as makes consideration for others by traders only reasonable to be required of them.

Alderman Boulton (Burslem) thoroughly agreed with the last speaker that manufacturers ought to be made to do their duty. It would be a great benefit to the firms themselves if they only educated their firemen how to deal with the smoke in the proper way. A great deal had been heard about the invention of all manner of appliances for reducing the amount of black smoke emitted from the chimneys. More, he believed, depended on the action of the firemen than upon the complicated apparatus they often saw put down at the present day. He lived in a manufacturing district, and he had continually held that the firemen could themselves reduce the amount of smoke by one half, if they desired, and knew their business properly. If this could be accomplished, it would be a great blessing to populous manufacturing centres like Leeds. The way to do it was this:—Having let their fire burn to a red glow, they should then put fuel upon the incandescent fuel, and by admitting a certain amount of oxygen by a grating in the fire doors or otherwise, the dense black smoke produced, which would otherwise pass up the chimney, became ignited, and passed round the boiler in flame, thus producing more heat. If it could only be impressed upon the manufacturer's mind that it would benefit him to have his firemen educated, much of the smoke nuisance would be remedied.

Dr. **Anningson** (Cambridge) said those who had had experience of food cooked in a gas-stove in an atmosphere filled with the products of combustion of the gas knew that such food was utterly spoilt. Everyone understood the difference between hot environment and radient heat. The only proper way to cook joints was exposure to radient heat by placing them in front of heated material. He, therefore, commended the old-fashioned method of cooking food before a fire.

Mr. H. N. **Dickson** (Oxford) said the question of sunshine record was one which was largely engaging the minds of meteorologists. There was a considerable amount of doubt as to the respective merits of the different types of instruments used. Mr. Jordan's instrument probably recorded more than the Campbell-Stokes, but there still seemed to be some uncertainty in defining what they actually measured. It was a matter of great interest and importance to find a series of observations made in the strictly comparable manner in which these observations had been made. They had been made in the same way and measured by the same observer. With regard to Mr. Cohen's paper, he would like to ask the author whether it would be really practicable to make bacterial observations from day to day over an extended area, and whether it would not be desirable, in connection with both these questions, to employ an Aitken's Dust Counter.

The President of the Section (Mr. Whitaker): I think it would be a good thing if two types of sun recorder were worked together at various stations so as to see the different results.

Mr. **Reynolds** (Leeds), who replied to the criticisms of the first paper, said he presumed the tables would be printed in the Journal of the Institute, where they could be more closely studied and analysed. It was a happy circumstance that the method selected for making their observations had not been the Campbell-Stokes system, which seemed to be somewhat under a cloud. The comparability of the records he thought was unimpeachable, since the computation of value for all stations was made by one person. Mr. Crowther and he were gratified that the subject had aroused so much interest, and they would certainly be encouraged to continue their investigations.

Dr. **Cohen** (Leeds), replying to Mr. Dickson's remarks concerning Aitken's Dust Counter, said he scarcely thought it would do for the purpose suggested. It only gave the number of dust particles. It did not detect the impurities that affected health at all. They might get more dust particles in an open street than in a confined and unhealthy court. On the other hand the determination of the number of bacteria was a simple process. It might be carried out in a systematic way without any great inconvenience, just in the same manner as sunshine records were taken, but with much more satisfactory results as regarded the condition of the atmosphere. The point he wished to bring forward most strongly was that persons who sent smoke into the atmosphere unnecessarily were really poaching on other people's preserves; an offence of this kind was quite unexcusable.

"*Water Supplies from Wells*," *by* J. MITCHELL WILSON, M.D., D.P.H.

ABSTRACT.

THE water supply in rural districts is still largely obtained from wells, many of these are of old construction, and have been made with few, if any, safeguards against pollution of the water from impurities in the surrounding sub-soil.

The greatly reduced mortality from enteric fever during the ten years, 1881-90, when compared with that prevailing during the earlier ten years, is considered in great part due to improved water supplies provided in rural districts. Dr. Mitchell Wilson quoted several examples from towns and villages in his own districts where outbreaks of enteric fever had been caused by impure well water, these had been replaced by wholesome water with an immediate reduction in the prevalence of cases of fever.

The Public Health (Water) Act, 1878, by its limitation of the amount of cost which a District Council can enforce in order to obtain a safer supply, through the construction of wells, prevents wells being made of a better class, and such as would secure a purer water from the strata at greater depth. Such improved wells had, however, been adopted by the Sanitary Authorities, and voluntarily by private individuals with highly satisfactory results.

Specially designed well tubes consisting of glazed sanitary tubes from 30 inches to 3 feet in diameter, have been largely adopted in the rural districts to the east and south of Leeds. As the socket is fixed on the inner side of the pipe the outer surface is smooth and offers little hindrance to the tube sinking; three or four tubes are usually required. It is believed that a well made with these is more secure against impurities reaching the water than when bricks are used.

Another method frequently adopted is to obtain water from the deeper strata when the geological formation is favourable. The water is reached by boring in the usual way. From 60 to 200 feet is the average depth in these districts needed to reach the new red sandstone rock which usually yields a good supply of wholesome water. The bore-hole is lined for two-thirds of its length, the remainder forms the well or the deep gathering ground. As an additional precaution, the lining tube is often carried above the level of the ground, and the suction tube of the pump is directly connected with the lining tube. Such wells cannot be provided within the limits of the Public Health (Water) Act. Experience has shown that to be quite successful the work ought to be carried out by a thoroughly competent well-sinker. At present there are no bye-laws or official specifications for the guidance of those advising upon or actually engaged in sinking wells. Matters of far less importance are regulated by bye-laws, and much of the unsatisfactory work in the sinking of wells in rural districts is due to ignorance of the scientific principles and newer methods based upon these, which can alone provide a supply of wholesome water from wells.

THE PRESIDENT of the Section (Mr. W. Whitaker) said he was sure they would wish him to offer their thanks to Dr. Wilson for his valuable paper, illustrated as it was by wells in Yorkshire, which, of course, was exceedingly interesting. He thought, however, that, for purposes of discussion, that it would be well to combine it with Dr. Thresh's paper, which he imagined was likely to be illustrated by wells.

[*For discussion on this paper see page* 619.]

"*Water supplies for Rural Districts and the means of protecting them from Contamination,*" *by* JOHN C. THRESH, D.SC., M.D., D.P.H., Medical Officer of Health, Essex County Council.

(MEMBER.)

IT is very gratifying to all those connected with public health work to find that increased attention is now being given to the question of providing rural districts with abundant supplies of wholesome water. It is surprising that the subject has been so long neglected. This neglect, so far as my experience goes, is due to two sets of causes. The first is the ignorance of our rural population with reference to the advantages of an abundant supply, and to the dangers attending the use of polluted waters. The second is the general apathy of rural sanitary authorities, and their lack of knowledge and unwillingness to ask advice with reference to the best mode of utilizing such sources of supply as are at their command, probably because they are of opinion that the provision of a supply of any kind will increase considerably the burden on the rates.

I have found in many districts that there were springs yielding considerable quantities of wholesome water running to waste when within a mile or two there were villages or hamlets badly in need of such a supply as these springs afforded. In other instances the subsoil contained and was capable of yielding an abundance of water, which if properly collected and protected from pollution would supply all the wants of the inhabitants of the neighbourhood. There are however many localities destitute of springs and with an impervious subsoil, but even in these places it is often possible to find and obtain water below the impervious stratum and at a reasonable depth. Where such is not the case the attention has to be turned to the possibility of impounding surface water from a suitable collecting area. In many localities it will be found more economical to supply a group of parishes from one source, rather than to provide separate supplies for each. Frequently this course is found to be more economical in first cost, and also in maintenance, especially is this the case where the water has to be pumped by an engine requiring fuel to afford the motive power.

Where springs are available, and the water rises at a sufficient elevation to supply the districts by gravitation, they form by far the most economical source of supply, as there is no annual outlay for pumping, and the necessary storage is but small and of the cheapest character.

Where the flow is sufficiently abundant, but the elevation insufficient, a ram, turbine, water-wheel or even a wind-mill may frequently be utilized to raise the water, and such appliances being automatic in action and requiring no fuel are very economical. The particular machine which should be used can only be determined when all the conditions peculiar to the district are known. The cost of raising water by oil engines is very small and in many instances this method may be adopted without rendering the cest unreasonable.

The subsoil as a source of water supply has unfortunately fallen into disrepute because the water from shallow wells (all of which is derived from the subsoil) is so generally polluted. I am convinced however that in most districts a perfectly wholesome water can be obtained from the subsoil, by selecting a suitable site and obtaining the water by aid of a tube well or a properly constructed shallow well. In several localities where other Hydrologists had recommended deep wells, involving an expenditure which was considered prohibitive, I have been able to obtain all the water required, and water of good quality, from the subsoil in the immediate neighbourhood, at a much more reasonable expense. Of course all such water requires to be raised by a pump. If only a few houses are to be supplied a wind-mill may be used, but if several thousand gallons per day is required it is better to provide a fuel motor, such as an oil or gas engine.

Where the only available source of water is from a permeable stratum lying under an impervious one, the expense incurred will generally be considerable, especially if the upper layer is 300 or more feet in thickness. The water will probably be of a high degree of organic purity, but it may contain sufficient iron, magnesia or other objectional matters as to render it useless. There is always more or less risk involved in deep well boring, either with regard to the quality or quantity of water procurable, hence a skilled hydrologist should always be consulted before deciding upon attempting to obtain water from such a source. In fact wherever there is any uncertainty about the quality or character of the water procurable, an expert should be consulted, but, by an 'expert', I do not mean the advertising expert who professes to find water by aid of a hazel twig or other similar means. My experience of such gentlemen is not sufficiently encouraging to enable me to recommend them, and public bodies who may be considering whether or not they should engage the services of a water-finder, must bear in mind that the Local Government Auditors have expressed very pronounced opinions as to the illegality of payments made for such services, or for work undertaken upon their advice.

In rural districts it must be remembered that the amount of water required per person per day is very much less than in towns. Little or none is required for what are known as 'Municipal' purpose, and baths and water-closets are few and far between. Besides this much rain-water is collected, and on account of its softness will be preferred and used for many purposes. Where the great majority of the persons supplied are of the cottage class, five gallons per head per day will at first be sufficient, but in time the water will be more freely used, and to be on the safe side fifteen gallons should if possible be provided.

In some districts the authorities are content with providing stand pipes at convenient points, whilst in others the owners are compelled to lay on the supply to each cottage or group of cottages. My impression is that less water is wasted when the water is laid on to the kitchen of each house than when stand-pipes are provided in the open. In the latter case the taps are neglected and are constantly left running, but in the kitchen this would lead to splashing or flooding, hence more care is taken to prevent such occurrences. When water has to be fetched from a stand-pipe more is generally drawn than is at the moment required and the remainder is either stored in the house in an open vessel such as a bucket (an objectionable practice) or else thrown away.

I am inclined to think, from experience with both systems, that no saving is effected by merely fixing stand-pipes, and it is certainly much more convenient and hygienic to have the water laid on to the premises, *i.e.*, within the house. Wherever possible also I avoid the necessity for the use of storage cisterns; a system which requires the provision of such storage is, to say the least, not entirely satisfactory.

One of the first questions to be considered with reference to any source of supply is that of cost. Can the scheme be carried out at a reasonable cost and what is a reasonable cost? If the total cost is known approximately the annual repayment of loan and interest can easily be computed, the rate being 5¼ per cent. when the loan is for 30 years and the payment is an equal annual sum covering principal and interest. To this must be added the cost of pumping, if the water has to be raised by a fuel motor or a small sum for attendance if a water or wind engine is employed. The sum which can be raised by a water-rate is 8s. 8d. per year per cottage and will average about £2 per house for larger houses, farms, shops, inns, &c. If the number and character of the houses to be supplied are ascertained, the annual income from the water rate is easily calculated. The balance, if any, must be paid from the general sanitary rate in the district supplied. If this balance be small, not exceeding say 3d. per pound on houses, it may be considered reasonable, but frequently, in districts where water is difficult to obtain, a heavier rate may not be unreasonable. Occasionally there are owners of property who will be especially benefited, and may be willing to contribute liberally towards providing a supply, and it may be well to remember that limited owners can charge their estates with an annual payment for a number of years, under the "Limited Owners Reservoirs and Water Supply further facilities Act, 1877."

Where public supplies of such a character as those I have indicated are not feasible, I think it is the duty of sanitary authorities to provide in every parish, public wells of proper construction, sunk in carefully selected situations and to maintain these in such a condition that the water obtained therefrom may be relied upon as being of a wholesome character. We cannot expect private persons to construct shallow wells properly until sanitary authorities set them an example. Unfortunately, at present, such is not the case, and it is very difficult to find a properly constructed well even amongst those vested in public bodies whose especial duty it is to safeguard the public health.

To prevent the contamination of a water supply, the situation should be carefully selected, and the surroundings should receive constant attention.* If the supply be from a spring the land for some little distance round should be protected so that there may be no fouling by cattle, no manure should be spread on the gathering ground within a radius of say 100 yards, and every care should be taken that no surface water gains access to the collecting tank or reservoir. If a spring has to be purchased, rights should be acquired over a sufficient amount of the ground above the spring to enable the authority to protect the water and ensure its purity. Where subsoil water is collected similar precautions must be taken, and the well or collecting reservoir should be so constructed that no water can enter at a less depth than 6ft. If possible it is desirable to render the sides impervious to a greater depth, so that the water can only enter at and near the bottom. This ensures that the water reaching the well has undergone a thorough filtration. Where this precaution is not taken, the water may become turbid after heavy rains, for when this occurs it is positive proof of imperfect construction and an indication of dangers from pollution. Where water is collected from a fissured stratum, it must be remembered that impurities may travel great distances in such fissures. This necessitates great care being taken in the selection of the site based upon a knowledge of the direction of flow of the underground water and the examination of the district for some distance around to ascertain possible sources of pollution. In all wells there are two points which require extra care in construction and special precautions to prevent surface water entering thereat. There are (1) the top and (2) the point at which the pump pipe enters the well. I always recommend the well to be bricked up to a little above the surface of the ground and to be covered with an iron water tight lid which can be locked. This affords an easy means of access for cleansing, and effectually prevents imperfectly purified water entering from the top. For an area of 6 or more feet around the top of the well and pump the ground should be paved with blue Staffordshire bricks. The gulley for removing the waste water should be so fixed as to remove all the waste and rainfall on the bricked area right away from the well. If there are any defects the water will find a line of least resistance along the course of the pipe connecting the pump with the well and may enter the well at that point if the connection is not securely made.

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* The great importance of these precautions has been emphasized by the serious outbreak of Typhoid Fever at Maidstone.

The surroundings of tube wells, whether driven or bored require similar attention to prevent the access of surface water. When tubes are driven the bulb at the end being a little larger in diameter than the tube leaves a track along which water from the surface can easily travel downwards, and as the pumping is direct from the tube, the water along this track is easily sucked into the tube and in the course of time the channel of communication becomes more open and the ground air and water around is freely drawn.

When surface water is being collected strict watch must be kept over the whole of the collecting area. An uncultivated, uninhabited surface is the best, and in any case some considerable areas around the points of collection should not receive manure of any kind. Human excrement should not be used on any portion of the collecting area, and if there are any houses thereupon, the system of sewage and refuse removal should receive special attention. Rain water collected from the roofs of outbuildings and houses will always be impure unless some system is adopted of rejecting the washings of the roofs.

Time will not permit of our discussing all the ways in which water supplies may be contaminated, for impurities may get in at the source of the water, into the storage reservoirs, and even into the mains. Improper connection of the supply pipes with water closets may result in the fouling of the water in the mains, and after its delivery into the house of the consumer it may become polluted if stored in cisterns. I should however like to direct your attention to a point which is often overlooked and that is the dangers arising from intermittent pollution. I will illustrate this by an example. I had recently to investigate a localised outbreak of typhoid fever, and I was led to suspect the water from a certain fountain. This had been frequently submitted to chemical examination and reported to be very pure. It had in fact been examined only a few days before and found to be very good. My enquiries however elicited the fact that the water had recently been observed to become turbid after heavy rain, and this convinced me that the water was liable to intermittent pollution, the analysis notwithstanding. Within a few days a heavy rainfall occured and I then examined the water and found it decidedly turbid and upon analysis it gave undoubted signs of sewage contamination. When the source of the water was traced it was found that a sewer near the spring had become crushed in, and when anything more than the normal amount of sewage was passing down a large quantity escaped and got into the collecting tank feeding the fountain. In another case I had a sample of water from a bored well and found it quite satisfactory. A few weeks afterwards, in consequence of a case of typhoid fever occurring I again examined the water and made inquries concerning its source. The sample proved to be contaminated and I found that the well was defective and that whenever the water level in an adjoining ditch rose above a certain height, the filthy matter from the ditch leaked into the well. We have only to look through the Reports of Local Government Board Inspectors and Medical Officers of Health to find numerous examples of outbreaks of disease attributable to this intermittent or occasional pollution. Wherever a water supply is affected by a heavy rainfall, so as to show any turbidity, it is evident that there is something wrong and a careful investigation of the cause should be made. If an analysis is decided upon select a sample when the water is so affected, the information required is the character of the water when at its worst. To send a 'fine weather' sample is to court disaster.

In conclusion, gentlemen, I hope that the results of our deliberation will be to give direct increased attention to this subject, the provision of water supplies to our rural districts. Apart from its sanitary importance it frequently possesses other advantages. If we wish to prevent the exodus from our villages, or attract the town dweller to the country, we must provide better water supplies and do all in our power to remove the stigma which at present causes all intelligent people to look with suspicion upon all water supplies in rural districts.

[*This discussion applies to Papers by* Dr. J. M. Wilson *and* Dr. J. C. Thresh.]

The President of the Section (Mr. Whitaker) said he was glad to convey to Dr. Thresh their thanks for his very interesting paper. Dr. Thresh was the Medical Officer of a large county, Dr. Wilson was the Medical Officer of a large and extended combination of rural districts. Both were in a position to speak of large areas which had rural water supplies. Their experience, therefore, was a thing that ought to be before them, and they would be glad to see it in print in the Journal of the Institute. In the first place he was glad to see that two of the main points he introduced in his address, that of the federation or combination of authorities with regard to water-supplies, and that of areas more or less protected from insanitary proceedings, had been introduced in both papers. He had observed that Medical Officers had a certain amount of reticence and bashfulness. In both papers they had been told of places of 200,000 inhabitants, and so on, but there was a hesitation in giving the names of those places. In some cases, he thought, they might have the names of places, where it would do no harm to anyone. They could quite understand that not being an official of any sort, not dependent on any place, and having no responsibility, when he found anything interesting he did not mind mentioning the name of the place. Dr. Wilson remarked that there was no official guide as to sinking a well. Though he (the President) was a Government Official for a considerable time, he looked with suspicion upon official guides. They were apt to look at things from an official point of view, and this sometimes led to the narrowing of views and the obstruction of proceedings. Dr. Wilson said that perhaps the Local Government Board might take this position. He (the President) did not think any Local Government Board official would thank him for suggesting more work. He thought the County Councils should give directions on the subject, but they should be general directions. Referring to the suggestion as to the use of earthenware tubes, the President said he did not know they could be used, but thought that if so they might be very good. They might notice in their capital Health Exhibition the manner in which earthenware was largely employed in place of iron. They had gone through the stone age and the bronze age, and it might be said that they had passed through the iron age and had arrived at the crockery age. Dr. Thresh said a great many sanitary defects were due to want of education. That opinion was supplemented by the illustration of the farmer who did not know of the existence of the old cesspool. "Don't know" was at the root of half the evils they came across. If people "knew" many of those evils would disappear. The supply of groups of villages was the thing to go in for, the individual village was often too poor to provide a supply of water for itself. He (the President) entirely agreed with Dr. Thresh's remarks about the divining rod. If any body wished to read about 200 or 300 pages about the divining rod, he should get the last volume of proceedings of the Psychical Research Society, in which the matter was fully considered. Before Dr. Thresh was Medical Officer to the Essex County Council, that authority did what was often done. It bought a site and prepared plans for the erection of a large asylum without even seeing whether there were any water near the site. As it happens, just at that particular place there had been a disturbance which shifted the beds in a strange and unexpected way, and there were no signs of water. Dr. Thresh's description of the successive use of the same water first for one purpose and then another, like steam in the triple-expansion engine, were very interesting. It was a happy idea. The only danger was that people might begin at the wrong end of the process, and wash the floors before they washed the pots. Water laid on to the cottages was much better than the stand-pipe system. He would not like to have to get up on a cold winter's morning and go 100 yards for water to a stand-pipe. It was a comparatively easy thing to conduct a research and to devise plans for large water-works, but it was much more difficult to get practical plans for the supply of villages and small towns. They were really the most difficult cases to deal with. What might be the most perfect method might be impracticable on account of the cost. He was glad to find, for practical reasons, that water from surface beds of gravel was regarded with greater favour than used to be the case. He would have been sorry years ago to suggest a supply from such a source; but in proper places, free from contamination, it was possible to get an excellent supply. For village supplies that was often the only chance one had of obtaining a supply at all. Even fair sized towns were sometimes glad to obtain such water. Research in that particular line would be very profitable to the community. Dr. Thresh was giving considerable attention to the subject. They must remember that they had to deal with small villages as well as towns.

Mr. Herbert Peck (Medical Officer to the West Lancashire Rural District Council), said he had to deal with an area of over 100 square miles. A few years ago they had 4,000 wells in the district. It was the rarest exception to find any useful shallow wells, and few of the deep wells were any good. They had had to go in for public supplies. They had seven near the district, and they had brought six into the district. He had come to almost completely disregard shallow wells as a means of supply. He had made some hundreds of analyses in five years, and he did not think the result in five per cent. of the cases had been satisfactory. It was quite a common thing to find the well within a few yards of a closet.

The President: Old wells, I suppose.

Mr. Peck, continuing, said that was so. At the present time something like 75 per cent. of their water came from public supplies. They had done away with something like 2,000 well-supplies in five years.

Mr. **John Bainton** (Scunthorpe) said several cases had been mentioned in which cesspools had been found close to wells. Several such cases had come under his notice, and people could not imagine why the well should not be near the cesspool. He remembered one case in his district on the estate of Lord Yarborough. It was a case where ignorance was bliss. The tenant complained that the water was polluted. They visited his premises and found that there was a cesspool close to the house overflowing into the well. With regard to stand-pipes, his experience was that they were impracticable on the public road as a supply. Not only were they the cause of waste, but it was an inconvenient mode of supply. In one village he knew more water was wasted than was used, and, because the people had so far to carry it, they used as little as possible. Now the water was laid on to the houses by order of the R.D.C., and about ten times as much was used, and the stand-pipes will last considerably longer.

The President: Is your district near Frodingham?

Mr. **Bainton**: Yes, it is close to that place.

Mr. **Percy F. Kendall**, F.G.S. (Yorkshire College), said he had been greatly interested in the two papers. They were the result of large and valuable experience in two very different directions. Dr. Wilson, owing to geological exigencies in his district, had been led to rely more upon individual supplies—wells for single houses, and groups of houses; whereas Dr. Thresh had been able, from the geological formation in his district, to deal with more general supplies from public sources. It seemed to him that the inherent difficulties had been very successfully coped with. Dr. Wilson's recommendation of wells with bore holes was exactly in accordance with his experience. He had met with many cases where the simple expedient of putting a bore hole down the centre of a well yielding an insufficient supply, had brought about an augmentation. The method Dr. Wilson recommended of lining wells and thus excluding the possibility of surface contamination, must always be considered superior to any other method. An intereresting case came under his notice a while ago, in the neighbourhood of Harrogate, where a large supply was needed to meet the wants of a thoroughly equipped dairy. The occupier had taken his degree at one of the Universities for Agriculture, and was prepared to go in for dairy farming on a large scale. He had separators, and needed a plentiful supply. The farm supply was inadequate. Here is the point! He sank a well and got a very large supply; but he did not pay attention to the exclusion of surface contamination, for at the time of his (Mr. Kendall's) visit to the farm a hurdle, covered with dung from the cow shed, was lying over the top of the well. He did not think sufficient had been said—Dr. Thresh had alluded to it in his suggestive paper, but he did not notice any mention of it by Dr. Wilson—of the necessity of carrying well tubes above the surface of the ground. He had been in a country recently where there was a good deal of well water. He took the trouble to examine a number of wells, but did not find one, the water from which was fit to drink. It was always extremely turbid. That was in Norway. They have elaborate covers over the wells, which are very picturesque, but they do not prevent the influx of impurities. As to the use of surface water, in heavily manured districts even more than 100 yards radius would be necessary. He had found in some cases that traces of mineral and other manures might be obtained in spring water where there was no possibility of contamination within 100 yards. Geologists always prefer deep well supplies. They had all their own axes to grind. Deep wells yielded him much information. His own feeling was against surface water where any other source was available, but in Dr. Wilson's district, where there were large areas of gravel and sandy drift in thinly populated districts, he would be inclined to think that water drawn from such sources would be preferable to that drawn from land abounding with magnesium limestone.

Dr. Brown (Bacup) said he was surprised that one of the readers of the papers was in favour of shallow wells. There was a great difference in the purification powers of sub-soils. What applied in his district might not apply to other districts. One matter had not been referred to by the two speakers, viz., the water supply from the roofs. That system obtained in some districts; in fact some time ago, when he was inquiring into the causes of lead poisoning, he came across a case where the water supply was obtained from the roof, and was collected in leaden tanks. The result was a grievous outbreak of lead poisoning. They were very severe cases. Rain water very quickly dissolves lead. He would like to ask the readers of the papers if they had had any experience of the divining rod.

Mr. Richard Pickering (Whitehaven) referred to the recently constructed works in the Western Division of Cumberland. In 1878, he said the large district extending from Cockermouth to the sea-board had a very deficient water supply. Cockermouth got water from the Cocker River; Workington from the Derwent River. Although the supply from these sources was not ample, many districts were glad of them because the water was comparatively pure. The time for some improvement came, and the first thing was to convince the urban population that it was expending a considerable sum each year in raising water from the rivers, and to make the people understand that if they would combine in a scheme to bring water from the lakes it would ultimately be better for them in a financial sense. The result was that a joint committee was formed to represent Cockermouth, Workington, and the large rural district around those places. They were fortunate enough to get a very strong chairman, and eventually an Act of Parliament was obtained in Session 1878-79, authorising a supply from Crummock Lake. They cut the first sod at Scalehill, near the lake, on August 1st, 1878, and a year following to a day they opened the works at Stainburn, near Workington. During 1879 the water was sent away into the various parishes round for a distance of about 24 miles. He insisted that every cottage should be supplied with its own service-pipes and tap inside the house. The consumption in the mining villages did not exceed six gallons a head per day, whereas in the towns, where old fittings were in existence, and the water was simply delivered in bulk into the reservoirs, the consumption was thirty to forty gallons per head per day. The wells in connection with farmhouses caused the greatest difficulty in the district from where he came. The wells and the middens were often contiguous to each other, and it was difficult to convince the people as to the danger. There was a village called Bootle, on the gravel drift formation at the base of the adjoining mountain range. The Medical Officer of Health made a sort of random shot that the people were drinking filth. He (the speaker) was put on the track and went to the village. In the village was an ancient inn, which had been in existence three hundred years, with a very old burial ground close by. He took the well water for analysis. Not far away was a dirty farmyard. All the drains led to the river through a gravel formation. He thought that was a likely place to find bad water and took a sample. Another he got from where there was a depression in the ground. into which the washings from the village had run for generations and ultimately disappeared. He got the county analyst to examine the water, and found them very bad indeed, particularly the one from the inn near the churchyard. The result of this discovery was satisfactory. A very good supply was obtained from the base of the adjoining mountain from granite gravel overlaying granite rocks. There was a workhouse about 350 yards away from the depression of the soil aforementioned. The guardians sank a well, which cost £100. Although there was a pretty good drift formation there was contamination, which he believed arose from the waste products in the depression in the soil. No doubt the people in the village had been drinking the dregs of their forefathers for generations.

DR. ANNINGSON (Cambridge) said as a rural medical officer of health he should like to offer his thanks to the readers of the papers for the valuable hints given on a most difficult question. The experience of Dr. Thresh was most encouraging. He would like to ask that gentleman, however, how he managed to overcome the Local Government Board's objection to small schemes. His remarks as to procuring water from shallow wells were encouraging, also because, as everybody knew, in certain rural districts where the stratum was not water-bearing, the difficulty and cost of getting water from a deep source was exceedingly great. In that regard he would like to refer to the President's remarks in his address (p. 304) with respect to the value and necessity of the extension of the geological survey of the drift, for in attempting to obtain surface water the guidance of the observation of the drift was needful. The deeper strata were of no value at all. Furthermore he would like to ask Dr. Thresh whether he had had any experience with regard to obtaining water from gravel caps, and whether he thought it possible to estimate from the maps the probable quantity of water that could be obtained from a gravel bed of limited area, and furthermore what he thought would be the best way of tapping water from such a source. It would be of great value to medical officers of health if they knew how to obtain water from gravel patches.

Dr. J. **Mitchell Wilson** (Doncaster) in reply said he thought it was their duty as Medical Officers of Health to make the very best of existing conditions and not to advise their sanitary authorities to go in for elaborate schemes if they could get all that was necessary from the existing conditions of the district itself. Dr. Brown has asked us to their experience with rain water. He had had a few year's experience of the Fen districts in Cambridgeshire where other drinking water than rain water was absolutely non-existent. But rain water formed a very insufficient and uncertain supply. A time of drought meant a water famine. When any other supply was available it was their duty to discard rain water. At the present time he had a large district by the side of a river where the conditions were pretty much the same as in the Fens. The people were driven to use whatever rain water they could collect. There was a confusion made between the bored lined well and the Abyssinian tube well. There were none of the latter in his district. The bored wells were the only ones he had described. He was pleased to tell Mr. Kendall that he had drawn attention to the fact that it was absolutely necessary to bring the lining tubes above the surface. Many good supplies were spoilt by stopping short with the tubes. Then, as regarded the depth he had recommended for taking the well tubes, it all depended upon the local conditions. Six feet would be quite enough in some districts. He had known many cases in which surface contamination was the cause of illness. He had been exceedingly interested in the experience of some of the gentlemen from other districts. It must be evident to every one that they were endeavouring to feel their way and to get the best available information for the benefit of their Sanitary Authorities. The discussion on the papers would be all helpful in that direction.

Dr. J. C. Thresh (Chelmsford) replying, said he was pleased such a general interest had been taken in his paper. Dr. Brown asked whether he had had any experience of lead poisoning from the collection of rain water from roofs.

The President: Dr. Brown referred to leaden cisterns.

Dr. Thresh, continuing, said there were no leaden cisterns. No single case of lead poisoning had occurred amongst the people using rain water. With reference to the "Divining Rod," he had

had some recent experience, and all he could say was that it was decidedly unsatisfactory. If they wanted a sub-soil water supply for a rural district, the first thing was to ascertain the area of the gravel patch. They must not place too much confidence in the drift maps of the geological survey. In the case of a little village with a population of about two hundred, the drift map showed that there was not a patch of gravel within three or four miles. Notwithstanding he found a rather large area very close at hand. Having found the area of the gravel patch, the next thing to ascertain was whether it was a basin or the cap of a hill. If it was a basin it was necessary to find the exact area, or otherwise, after the well had been sunk, the supply might fail. They must ascertain the rain-fall, and know, approximately, the amount that would percolate, and the amount that would be lost. Having obtained that information, they could calculate the amount of water that would be yielded by any particular patch of gravel. The Local Government Board would not sanction a scheme until borings had been made, and pumping operations had gone on for two or three weeks. It might cost many pounds to get the information, but it was well worth it, and was the only safe plan. He had had several discussions with the Local Government Board Officials, but had always found them disposed to be reasonable. With reference to deep wells and Abyssinian tube wells, there were a number of both kinds in his county, and the same objection applied to both if they pumped directly from the bore tube.

"*The Action of Moorland Water on Lead and the Prevention of the same,*" *by* C. H. TATTERSALL, L.R.C.P.Lond., M.R.C.S.Eng., L.S.Sc.Durh., Medical Officer of Health, Oldham.

(MEMBER.)

THE action of moorland water on lead is a matter of the utmost importance to all authorities which obtain their water supply from the moors.

Water from this source is generally speaking most satisfactory, being soft and remarkably free from contamination of any kind. Whatever contamination there may be is due to the presence of small quantities of organic matter dissolved by the water from the peat.

Unfortunately the presence of this small amount of organic matter causes an action on lead more or less active in proportion to its amount.

This action has at times proved very destructive to various communities using this kind of water, one of the best known examples being Sheffield, which suffered severely from plumbism from 1886 to 1889.

In the autumn of 1895 I heard from different sources of a number of cases of suspected lead poisoning in Oldham, and in each instance enquiries were made as to the possible causes of the poisoning, with the result that, with one exception, there was no other assignable cause, than the use of the water laid on to the houses through the ordinary lead service pipes.

The water in each case was sampled, and found to contain lead in quantities, varying from one-tenth to two-fifths of a grain per gallon. In one of the worst cases the old lead service pipes were removed and replaced by block tin lined pipes.

An examination of the old pipe revealed the presence of a copious brown deposit in flaky masses lining the pipe, and this was found to contain some salt of lead, although the quantity was not sufficient for an exhaustive examination.

These facts led me to make an examination of the water from the various reservoirs, with a view of ascertaining, as far as might be possible, on what this plumbo-solvent action depended, and whether the various supplies differed from one another in this respect.

It was found that all the waters were more or less acid, although the amount of acidity in the worst sample was very slight when compared with many of the moorland water supplies in the West Riding of Yorkshire, notably Sheffield and Wakefield.

This acidity is, I feel convinced, due to the action of exposed peaty land which forms a portion of the gathering grounds for each of the three series of reservoirs, Piethorn, Denshaw, and Castleshaw, and is not as has been sometimes suggested due to the influence of the impurities in the atmosphere.

It is worthy of notice that the waters containing the greatest amount of albumenoid ammonia were the most acid; and this albumenoid ammonia is almost certainly derived from the peat.

Before going further it will be better perhaps to explain shortly the arrangements of the Oldham Waterworks.

The reservoirs are situated in three valleys, Piethorn, Denshaw, and Castleshaw, situated about six miles to the North-east of the town.

The water from the Denshaw series of reservoirs is decanted into Hanging Lees, the upper reservoir of the Piethorn series, and thence, either delivered to the higher portion of Oldham or again decanted into the Piethorn Reservoir, from which it is supplied direct to the town.

The Castleshaw water is carried to Strinesdale Reservoir, near the town, and from there delivered to the town service.

The whole of these gathering grounds are the property of the Corporation, and the land is not cultivated or manured in any way, and every care has been taken to prevent any possible pollution of the water.

The sides of the valleys consist of grassy slopes, off which the water rapidly runs, although the soil is to a great extent peaty. A portion of the land at the top of the slopes which drain into the reservoirs consist of peat, on which a little rough grass and heather grows.

It is very interesting to find that the acidity of the water in the various reservoirs, with the exception of Strinesdale, to which I shall refer later, was found to vary with the proportional amount of this unprotected peaty land which drains into it.

The streams running into the reservoir were found to be generally more acid than the reservoirs, and the further up the hillside they were followed, the more acid they were found. In the course of these streams numerous settling tanks have been constructed, and it would seem that in respect to this acidity, as well as in the settling of suspended matter, they serve a most useful purpose.

The analysis of the water from the various reservoirs, set out in detail in the following table, shows that the Oldham water is exceedingly good, and in every way a most satisfactory supply for the town.

TABLE I.

Analysis of the water taken direct from the following reservoirs.

Source.	Total Solids in Grains per Gallon.	Volatile Solids in Grains per Gallon.	Chloride Grains per Gallon.	Hardness.			Free Ammonia in parts per Million.	Albumen Ammonia in parts per Million.
				Permanent Hardness.	Temporary.	Total.		
Piethorn Reservoir ...	5·5	0·5	1·05	3·0	0·0	3·0	·00	·03
Hanging Lees	5·0	1·0	1·05	3·0	0·0	3·0	·15	·01
New Year's Bridge, Denshaw	5·0	1·0	0·98	3·5	1·0	4·5	·00	·04
Castleshaw	5·0	2·0	0·7	2·0	1·0	3·0	·00	·12
Strinesdale	6·0	3·5	0·98	2·5	1·5	4·0	·00	·13

The waters were also examined for acidity, with the results shown below. The acid was reckoned as sulphuric acid and expressed as such in grains per gallon. Phenol-phthalein was used as an indicator, and the titration was made with a standard solution of sodium hydrate, of which one cubic centimetre was equal to one milligram of sulphuric acid.

Table II.

Acidity of the Waters from the Various Reservoirs.

Source.	Acidity of Sulphuric Acid in grains per gallon.
Piethorn	·35
Hanging Lees	·28
New Year's Bridge, Denshaw ...	·49
Castleshaw	·56
Strinesdale	·63

The most interesting point in these analyses is the difference which was found to exist between the Castleshaw and Strinesdale waters. The Strinesdale reservoir receives only the water from Castleshaw, which is conveyed in iron pipes and delivered in a spray into the Strinesdale reservoir. There may be springs in the bed of the reservoir but the amount of water from them must be so small as to have no possible effect on the general condition of the water, and great care has been taken to exclude all surface water from the Strinesdale Valley.

The only possible source of the differences observed seems to be contamination from the air, all the water being sprayed into the air not more than half-a-mile from a number of mill chimneys, and in fact the reservoir lies just above the watershed end of the town.

To ascertain the effect the atmosphere had, some absolutely neutral distilled water was exposed for some days in the immediate vicinity of the reservoir, with, however, only negative results; but this is not at all conclusive, as water sprayed into the air is much more likely to dissolve out impurities than when a quiet surface is simply exposed to atmospheric action.

Having now ascertained the exact composition of the water and the fact that it was acid in reaction, experiments were made to test the extent of its action on both lead foil and ordinary lead pipe, with the result shown in the following Table:—

TABLE III.

Source.	Appearance after three weeks' contact with—	
	Lead Foil.	Lead Pipe.
Piethorn	Much greyish deposit......	Slight greyish deposit ...
Hanging Lees	Greyish deposit, with slight glistening appearance	Greyish deposit, with slight glistening appearance.
New Year's Bridge, Denshaw	Grey deposit...............	Grey deposit and much brown suspended matter.
Castleshaw	Slight tarnishing of metal	Yellowish white deposit, with glistening particles.
Strinesdale	Greyish yellow deposit, with slight glistening particles, easily detached.....................	Same as foil, but much more marked.

Although the physical appearances noted above point to the action on lead pipe, which is not pure lead, being greater than on lead foil (chemically pure), analysis did not confirm it, as in each instance only a trace of lead went into solution, and a comparison of the amount was almost an impossibility.

The glistening particles noticed in the case of the water from Strinesdale, and in a less degree in that from Castleshaw, were separated and allowed to dry by contact with the air, and were afterwards treated with a further portion of water from the same reservoir, allowed to remain undistributed for a few days, and then analysed.

Although after the first experiment only a trace of lead was found, this further experiment of allowing the deposit to dry and oxidise resulted in a tenth of a grain of lead per gallon being dissolved ; it would thus be most dangerous for the Oldham Water Supply to become intermittent.

The nature of the organic acid in peaty waters has not so far been ascertained owing to the small quantity present, and the impossibility of concentrating a solution, as the application of heat seems to destroy the acidity. It would appear from the above experiment that it is this acid, and this acid only, which causes the action of peaty water on lead, and this fact seems to be confirmed by the experience of outbreaks of Plumbism especially in Sheffield.

Mr. Eaton, in reporting on this question to the Sheffield Corporation, gives it as his opinion that the increased action on lead of the Sheffield water was largely due to the precaution which had been taken to prevent mineral and suspended matter mixing with the water, and he also noticed the fact that the action of the water on lead is much more energetic in Winter, especially after the melting of snow, when the proportion of surface water to spring water is of course very greatly increased.

METHODS TAKEN TO PREVENT THE ACTION OF MOORLAND WATER ON LEAD.

Many methods have been tried to prevent this action of moorland water on lead. As far as Oldham is concerned every effort is made to get the rainfall off the peat as quickly as possible by cutting numerous trenches through it, and as soon as the water is off the peat, it is delayed on its way to the reservoirs by passing through numerous settling tanks. Even after reception into the reservoirs it is decanted from reservoir to reservoir several times before being passed on to the town. It is thus exposed for prolonged periods to the sun, which has been shown to have a definite bleaching action on this water, and also by this means every opportunity is afforded for the subsidence of all matter not actually dissolved in the water.

In Sheffield a number of experiments have been tried for finding the best and most economical method of dealing with this matter, which Mr. Eaton describes in his report abovementioned:—

(1) Limestone containing a large proportion of silica was placed in the conduits, where the water was in contact with the limestone for a period of not less than twenty minutes; this however had no effect whatever on the water.

(2) Quicklime or milk of lime was added to the water in small proportion, and although this stopped the action of the water on lead, it gave rise to other effects, namely, the precipitation of iron in solution in the water, together with some of the organic matter, in consequence of which a red flocculent precipitate of low specific gravity was present in large amount, and this could only be separated from the water by slow subsidence or filtration.

(3) Soluble silicates were added to the water, but the results were not satisfactory.

(4) Carbonate of soda added to the water was found to act well in stopping the action of the water on lead, and no coating was found on the pipes, but as soon as the addition of the salt to the water was stopped the action on lead recommenced.

(5) The water was then filtered through a stratum of limestone and flint with apparently satisfactory results, but I

have no knowledge as to whether this was tried on an extensive scale or not.

(6) Finally, at the present time the difficulty is satisfactorily met by allowing the water to flow over a substance known as calcium carbonate, from which it dissolves about two grains of chalk per gallon; and since this treatment has been inaugurated there has been no further trouble with regard to lead poisoning from the water supply. It has not been considered necessary by any of the Lancashire or Yorkshire Authorities to filter this moorland water. I am of opinion, however, that filtration in the ordinary method through filters of sand and gravel would prove effectual in preventing this action upon lead in addition to improving the general appearance of the water, and acting as a safeguard against the possible introduction of pathogenic germs such as have been shown to occur at Rotherham and other places.

The methods referred to have all reference to the treatment of the water before its distribution to the town. Attempts have also been made to save the population from plumbism by substituting tin-lined lead pipes for the ordinary kind, this has been tried in Oldham, where unfortunately a large quantity of so-called tin-lined lead pipe has been used for domestic water service; this pipe is supposed to be washed with tin in a molten condition on its inner surface, and it has a whiter and brighter appearance than ordinary lead pipe.

I obtained a portion of this tin-lined pipe, and experiments showed conclusively that it was "*absolutely valueless*" in preventing the action of the water on the lead, for there was no difference in any way between the action of the water on this pipe and the ordinary lead pipe.

Similar experiments were made with blocked tin-lined lead pipe on which a plumber had made an ordinary wiped joint, and traces of lead were found in the water, but the quantity was much less than with ordinary lead piping, and from the piping when tried without a joint no trace of lead was discovered.

This pipe consists of a tin pipe about one-eighth of an inch thickness placed within lead piping; it is much more expensive than ordinary piping, but the water, except in the case of wiped joint pipes, cannot come in contact with the lead.

In conclusion I would suggest that the best means of preventing lead poisoning by moorland water are:—

(1) That the water be got off the peaty gathering grounds as quickly as possible.

(2) That as much time as possible be given for subsidence and bleaching.

(3) And most important, that the water be filtered through

ordinary sand filters or failing this be passed over "Paris White" as at Sheffield.

(4) That blocked tin-lined lead piping of good quality be used for water service pipes instead of ordinary lead piping.

THE PRESIDENT of the Section (Mr. Whitaker) said they desired to thank Mr. Tattersall for his paper. and also Mr. Richardson for kindly reading it in his absence. He would like to draw attention to one or two points. First in regard to the difference in the water in the Castleshaw and Trinesdale reservoirs. The difference was interesting, because the latter received all its water from the former. The difference must, therefore, occur in the passage from one to the other. Whether it was due to the air, as Mr. Tattersall suggested. he would not like to say, but it was certainly rather peculiar. There was another remark in the paper which illustrated how each case ought to be dealt with on its own merits. Whilst it was well to expose these moorland waters to the air, pure limestone water was deteriorated by such exposure. Light should be kept away from chalk water. It was strange, too, that this process of filtration had now been found to do a great deal of other things. It acted bacteriologically as well as destroyed the lead salt in the water. This shows that filtration was an extremely good thing. One remark occurred twice in the paper. What was "Paris white?" He did not remember anything by that name, and trusted some one would enlighten him on the point. It was clearly not plaster of Paris.

Mr. RICHARDSON (City Analyst, Bradford) said the subject of lead poisoning had been so often discussed that it was difficult to say anything new. Scientists had combined to endeavour to find a solution of the cause for the action of water upon lead. He had had a great deal to do theoretically with the subject. The plumbo-solvent action which once characterised the water at the Thornton Moor reservoir had been completely prevented by allowing the water to act upon limestone. It was found if the hardness of this water was as low as 1·2 on Clarke's scale it was certain to act upon lead. Indeed the action was very considerable in some cases. If the hardness could be raised to 2½ degrees by allowing it to mix with powdered limestone the action was almost completely destroyed. He agreed that it was not always an organic acid that produced this plumbo-solvent action. In one test he found a small portion of sulphuric acid. It would be interesting to know whether waters were not affected by coming in contact with sulphides of iron whilst coming over the moors; when a water contained sulphuric acid the amount of chlorine was considerably reduced by evaporation. If they tried experiments with organic acids in waters they would scarcely find that small quantities of these substances produced plumbo-solvent action. He did not think the lead poisoning difficulty had yet been completely solved. To use some form of limestone was however certainly the best means of preventing upland surface water acting upon lead. "Paris white" which had been referred to he believed to be very finely powdered carbonate of lime. There seemed to be some truth in the statement that the addition of silica to water prevented to some extent plumbo-solvent action.

The Rev. W. **Lower Carter** (Mirfield) desired to know how far it was satisfactory to substitute iron service pipes for lead pipes in districts troubled with lead poisoning? This had been done to some extent in the valley of the Calder. It was however difficult to get the sanitary authority in some districts to agree to anything but lead pipes for household purposes.

Dr. **Brown** (Bacup) was sorry Mr. Tattersall was not present, for he could not agree with all parts of his paper. Mr. Tattersall said the amount of peat in the water seemed to determine the extent of its plumbo-solvent action. From a number of experiments he found that that almost entirely depended on the amount of dissolved oxygen in the water. Just in proportion to the amount of dissolved oxygen removed was the plumbo-solvent action lessened. He was convinced the dissolved oxygen was the cause of plumbo-solvent action, and that the peaty condition of the water had little to do with it. Neither had the acid much to do with it. He had detected acids, mostly organic acids. If they boiled moorland water, and then carried out the experiment by putting petroleum on the top of the water, it would prove the oxygen which formed hydrates of lead was a great factor, and that its peaty condition had little to do with it; nor did he think the amount of acid on the water had much to do with it. He had on two or three occasions detected sulphuric acid in water. A good deal of iron was usually present in moorland water, being obtained from the shales and millstone grits. The prevention of lead poisoning was the simplest thing in the world. They must not use lead pipes, and as lead was not obtained from the moors, they would therefore get no lead in the water. Why should they use lead pipes, when steel pipes had been brought to such perfection? He had carried this theory into practice at his own home, where he had the old lead pipes removed. The only danger about an iron pipe was that it was apt to be oxidised by water obtained from the moors. However, his own pipes at home had been in for three or four years, and they were all right yet. True, lead pipes gave way a little to the frost, whilst iron ones split. To prevent house-flooding however, they must have a stop-cock placed outside, which they could turn off until a plumber had carried out the necessary repairs to the iron pipes.

Mr. **Branson** (Leeds) contended that acidity was one of the causes of lead poisoning. Dr. Houston, of the Local Government Board, had paid considerable attention to the bacterial side of the question, and found that the source of its acidity was bacterial. Whatever might be the nature of the cause, it was satisfactory to have some consensus of opinion as to the remedies to be applied. He could confirm some of Mr. Tattersall's conclusions. The addition of sufficient lime or carbonate of soda (equal to not less than half a degree of temporary hardness) to water containing three or four degrees of permanent hardness, would render it innocuous for public supply. In the case of some waters it was not admissible to add lime, as it was possible to have more lime than manufacturers wished to have, and carbonate of soda was a ready agent in that case. In the West Riding the solvent action of water on lead had caused considerable trouble, and it was not saying too much to assert that the health of very large communities in this area was wholly dependent upon a few experts. With regard to the agent to be used to detect acidity in these waters, Lacmoid was an excellent re-agent.

Mr. Reynolds (Leeds) maintained that in giving certificates of water analysis, the Analyst should ascertain how long the water has been in contact with lead. This was a vital question in the West Riding district.

Mr. Richardson (City Analyst, Leeds,) agreed with Mr. Branson as to the merit of Lacmoid. His practice had been to use neutral lacmoid papers, from which very useful results could be obtained.

The President of the Section (Mr. W. Whitaker) in reference to Mr. Carter's remarks concerning iron pipes, said a strong objection to them was that they could not be bent. Anyone who could bring forward a process which would expeditiously show the amount of lead in water, would confer a great benefit on Medical Officers of Health.

REVIEWS OF BOOKS.

THE DWELLING HOUSE.*

This work is mainly a criticism on some of the modern methods of sanitation, and an eloquent discourse on the overcrowding on area, and other evils, which follow in their train. The subject matter, though viewed scientifically, is handled in a semi-popular manner, and the result is a work which furnishes very interesting, profitable, and pleasant reading.

In his opening chapter Dr. Poore deplores the increasing scarcity of fresh air in great towns; he draws attention to the fact that lofty houses have often been suffered to practically convert streets into "draughty cañons," and even "the sacred front parlour where the register is closed and the blinds are drawn" is irreverently denounced.

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* The Dwelling House, by G. V. Poore, M.D., F.R.C.P. Crown 8vo., 178 pp. Longmans, Green & Co., London. 1897. Price 3s. 6d.

Certainly the cold damp odour of mildew and soot which assails the nostrils when those sacred precincts are entered is familiar to us all.

In a chapter on "overcrowding," Dr. Poore attacks the subject of the alleged "healthiness" of London, and many of his readers will agree that in this particular instance he fails to carry his point. The most vulnerable part of his argument is where, on page 97, he compares the death-rate per million persons living of children under five in the County of London with those of other *Counties.* It is an accepted fact that the death-rate, especially among infants, is less in country districts than in towns, yet he is comparing the death-rates of an area which is practically one large city with those of areas containing a considerable proportion of rural district, and the surprising fact is not that the County of London does not occupy the most favoured position in such a table, but that it comes out as well as it does. Dr. Poore points out that the deaths among children under five, from all causes, per million, for the decennium 1881-90 were:—

County of Lancashire	..	72,795
„ London	..	68,164
„ Hampshire	..	42,222
„ Dorset	..	35,651

But in Lancashire the rate is well above that of London County, despite the fact that in the latter there is more than 15 times the crowding on space (*i.e.*, 0·02 acres to each person as against 0·35 in Lancashire); it must be borne in mind, moreover, that in Hampshire there are only two large towns, and in Dorset none at all, and that the birth-rates in both counties are below that of London. This illustration, therefore, neither serves to adequately demonstrate the evil of overcrowding on space, nor does it show that London, despite its overcrowding, is not remarkably healthy—*as a city.*

Other chapters in the book deal with:—"Defects in Planning," "The Sanitation of the Isolated Dwelling," "Slop waters," "The circulation of Organic Matter," and "The Soil in its relation to Disease and Sanitation," and each subject is treated in accordance with the well known views which Dr. Poore so ably advocates concerning the disposal of the refuse matters from dwellings.

H. R. K.

COMPRESSED AIR ILLNESS, OR THE SO-CALLED CAISSON DISEASE.*

This is an excellent book on a subject of great scientific interest, viz., the effect of compressed air on the human frame in full activity, as exemplified in workers in pneumatic tubes or caissons.

The author furnishes an elaborate history of the various experiments and undertakings of this kind in different countries, and their results; but what is most instructive is his account of the construction of the Blackwall Tunnel, and the effect of the atmosphere of the caissons on the health of the workmen under his charge as medical officer.

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* Compressed Air Illness, or Caisson Disease, by E. Hugh Snell, M.D., B.Sc.Lond. 8vo., 251 pp. H. K. Lewis. 1896. Price 8s.

Dr. Snell remarks: "The total length of the tunnel from entrance to entrance is 6,200 feet; that part under the river is 1,212 feet and is horizontal; the remainder consists of the two inclined approaches —the one on the North side with a gradient of 1 in 34, and that on the South side with one of 1 in 36. The open approaches on the two sides account for a length of 1,735 feet. The first portions of the tunnel proper were constructed on the 'cut and cover' plan, and the water was dealt with by pumping; in nearly the whole of the rest compressed air was necessary. The depth of the floor of the river portion below high water mark is 80 feet.

The maximum air pressure employed in this portion of the tunnel was 27 lbs. to the square inch, and the average pressure a few pounds below this."

The number of men employed at one time in the compressed air chamber varied from thirty to eighty, and they were arranged in shifts of eight hours each, with an interval of three-quarters of an hour for a meal, so that each man actually spent seven and a quarter hours per day in the chamber. A lift was provided to bring the men to the surface without exertion, and hot coffee was given to them and a hot room provided for them to change their clothes and to rest in after emerging from the compressed air.

The best feature of the Blackwall arrangements, and quite a novelty in these proceedings, was a medical air lock, constructed out of a boiler, in which re-compression could be effected without the patient being carried below, and thereby interfering with the traffic through the ordinary air locks.

Some 200 men suffered to a greater or less extent from their sojourn in the caisson, and fifty cases are carefully recorded, and from these it appears that no deaths occurred, and only four instances of slight paralysis, generally of a temporary kind.

The majority of the symptoms were those of discomfort connected with unequal pressure on the two sides of the auditory membrane, auditory vertigo, and some affections of the nervous system, especially the so-called "bends," where the worker is seized with pains of an excruciating kind, in the thighs, the elbows and shoulders, the locality being varied, sometimes it is the bone, sometimes the fleshy parts, and sometimes the joints; the pains not particularly affecting the large nerve trunks. There is occasionally tenderness over the seat of pain but no swelling or discoloration, and the pain may pass off in a few hours, or may last for one or two weeks. In all cases re-compression in the medical air lock gives the most successful result. The other symptoms mentioned were few and for the most part rare, such as epistaxis and hoemoptysis: but Dr. Snell noticed that the men employed had a pale leaden appearance, where ventilation of the caissons had not been properly attended to.

With regard to the causation of the symptoms, our author holds it to be due to—(1) The pressure itself, as the higher the pressure the larger the amount of illness prevailing among the men. (2) The length of stay in the compressed air, for if a worker remained beyond the shift of eight hours, he generally suffered. (3) Ventilation. It was found that if ventilation was thoroughly carried out, and the workers supplied with a good change of compressed air, the number of cases of illness diminished to about a fourth. (4) Rapid locking out or de-compression. All former authorities have considered this to be the principal cause of caisson disease, but our author cites instances from his experience at Blackwall to throw doubt on it, though anybody who reads Paul Bert's famous book on "Pression Barometrique," or has had any experience of compressed air baths, will be inclined to say that Dr. Snell undervalues this cause of illness. (5) The age and habits of the workers have an important influence on the liability to caisson disease, this being largely increased after forty years of age, and men of drinking habits suffer more than others.

Our author gives a short resumé and criticism of former theories and experiments, and ends with an admirable chapter on treatment preventive and curative, of which it may be truly said the proof of the pudding is the eating, for he can point with pride to the great difficulties of the Blackwall tunnel and the very small amount of sickness among the workers. The introduction of the medical air lock and its speedy employment for the cases of caisson disease doubtless did as much to cure the illness as the improved ventilators and other precautions to prevent it.

The ventilation question is greatly enlarged on by Dr. Snell, and was evidently the subject of some of his most careful investigations. His great aim is to prove that the symptoms of compressed air disease are more the result of inefficient ventilation in the caisson than due to the change of pressure caused by rapid locking out, which the workmen, in their hurry to get home, frequently have recourse to.

Starting with the modern rule that a human being requires 3,000 cubic feet of fresh air per hour, in order that the air of his rooms may not contain more than ·06 per cent. of carbonic acid, Dr. Snell holds that a man in full work ought to have three times that amount, or 9,000 cubic feet, to preserve purity, and he states that it is certain that nothing below this is admissible in a compressed atmosphere. The following table is one of many striking ones in this book. The pressure on all the days was never less than 25 lbs., and occasionally rose to 35 lbs.

Cubic feet of fresh air per man per hour.	No. of days.	Cases of illness.	Estimated cases of illness for 100 days
Below 4,000	13	41	315·5
Below 4,000 to 8,000	26	78	300
From 8,000 to 12,000	10	8	80
Above 12,000	12	4	33·3

From this it appears that estimated cases for 100 days fell from 315·5 to 33·3 on the increase of the cubic feet per man from 4,000 to above 12,000 cubic feet.

Enough has been said to show that Dr. Snell's is a most interesting work, and will well repay a careful perusal, not only by medical men and hygienists, but also by civil engineers and contractors who have large bodies of workmen engaged in similar projects.

C. T. W.

NOTES ON BOOKS AND PAPERS IN TRANSACTIONS.

"British Institute of Preventive Medicine, Transactions of First Series." 163 pp. 8vo. *Macmillan & Co.* London, 1897.

In this journal there are nine bacteriological papers contributed by members of the staff of the Institute. The subject of the sterilisation of milk is dealt with by Dr. A. Macfadyen, and the sterilisation of water by filtration by Joseph Lunt, B.Sc. These gentlemen are also authors of the chapter "Bacteria and dust in the air."

Dr. R. T. Hewlett deals with the "Bacillus of bubonic plague" and the diphtheria bacillus.

"Incorporated Association of Municipal and County Engineers, Proceedings. Vol. XXIII, 1896-97." 480 pp., 8vo. *E. & F. N. Spon.* London, 1897.

The papers and discussions at the Association's meetings at Bristol, Westminster, Dover, Ripon, Market Harborough, Rochdale, Eastbourne, Llandudno, Stafford, and London, are given in this volume. At most of these meetings the opportunity has been taken for describing the various sewage, electric light, water, and other public works of these places, which to those interested in sanitation are of interest. Mr. W. J. Dibdin deals with biological purification of sewage; Dr. G. Reid, sewage disposal by artificial filtration; Mr. W. Weaver, the scavenging of Streets.

In the Appendix is given the Report of the Committee of the Association on the proposed Drainage By-Laws of the London County Council and a description of the Sutton Sewage Works, by Mr. C. Chambers Smith.

"The Institution of Civil Engineers, Minutes of Proceedings," Vol. CXXX. Part IV. 1896-97.

In these minutes is contained the "James Forrest Lecture," given by Dr. G. Sims Woodhead, on "Bacteriology."

Abstracts of the papers read at the Engineering Conference in May, 1897, are given. Mr. Rogers Field deals with House Sanitation; Mr. H. P. Boulnois, Refuse Destructors; Dr. E. Frankland, The Bacteriology of Water Supply.

Among "Abstracts of Papers in Scientific Transactions and Periodicals" are—

The Purification and Ventilation of the Subsoil, by Herm Koschmieder (Gesundheits-Ingenieur, 31st July, 1897, p. 229).

Separation Systems, by Metzer (Geshundheits-Ingenieur, 15th August, 1897, p. 241).

The Construction of the Clichy Main Sewer, Bechmann (Annales des Ponts et Chaussées, 1897, p. 267).

The Chicago Drainage Canal, by F. W. Skinner (The Engineer, 6th, 13th, 20th August, 1897, p. 125 *et seq*).

The Utilization of New York City Garbage (Scientific American, 14th August, 1897, p. 102).

Amount of Formic Aldehyde evolved by means of Lamps, or by the use of Formalin, for Disinfection Purposes, by Paul Striever (Zeitschrift für Hygiene, Vol. XXV., Part 2, p. 357).

"Notes on Practical Sanitary Science. Part II.—Calculation of Areas, Cubic space, &c.," by W. H. MAXWELL. 50 pp., 8vo. *Sanitary Publishing Company.* London, 1897.

The Notes the author has published with a view to their being of service to candidates preparing for professional certificates.

This part consists of a large number of Rules and Formulæ, and it is hoped will form a summary of the subject of Mensuration for the use of Engineers and Surveyors.

The subject is dealt with under Geometrical Theorems; Calculation of Lengths; Right-angled Triangles; The use of Trigonometry and Logarithms; Summary of Properties of the Circle; Calculation of Areas; Areas of Surfaces of Solids; Calculation of Cubic Capacity or Volume; The Volume of Irregular Solids; Practical Examples; Calculation of Quantities of Earthwork.

MEETINGS HELD.

SESSIONAL MEETINGS.

A meeting was held on November 17th, when a discussion was opened by Professor W. H. Corfield, M.A., M.D., F.R.C.P., on "The Pollution of Water Supplies by Encampments of Hop-Pickers, Casual Workers, Tramps," &c., in reference to the Dangers of Pollution of Municipal Water Supplies; and by Miss M. A. Chreiman, in reference to the Sanitary Control of Hop-Pickers, &c. Sir Douglas Galton, K.C.B., D.C.L., LL.D., F.R.S., in the Chair. The papers and discussion will be printed in Part I., Vol. XIX., of The Journal. About 100 Members, Associates, and Visitors attended.

LECTURES AND DEMONSTRATIONS TO SANITARY OFFICERS.

The Twenty-fourth Course of 17 Lectures and 15 Practical Demonstrations and Visits of Inspections to trade premises, Refuse Disposal Works, commenced on September 27th. 52 Students entered their names for this course.

ALTERATION IN BY-LAWS.

The attention of the Members is called to the following alteration that has been made in the By-Laws of the Institute. Clause 31 now reads as follows:—

31.—A Board of Examiners shall be elected annually by ballot by the Council. Notice of the meeting at which the election will take place, with names proposed, shall be sent to each Member of the Council not less than six days previous. One-fourth of the Examiners shall be ineligible for re-election for one year.

EXAMINATIONS.

At an Examination held at Newcastle-upon-Tyne, 2 Candidates presented themselves for Examination in Practical Sanitary Science, and 26 for Inspectors of Nuisances.

The following 9 Candidates were certified, as regards their Sanitary Knowledge, competent to discharge the duties of Inspectors of Nuisances:—

1897, Nov. 13.	ALMOND, WILLIAM, 20, Coatsworth Rd., Gateshead.
1897, Nov. 13.	BEATY, GEORGE, 12, Hill Street, Willington Quay.
1897, Nov. 13.	DAVISON, JOHN WILLIAM, 33, Aline Street, South Benwell, Newcastle-on-Tyne.

1897, Nov. 13.	Downes, Thomas Henry, 32, Hylton Street, Sunderland.
1897, Nov. 13.	Gregory, Thomas, District Council Offices, Newburn-on-Tyne.
1897, Nov. 13.	Jameson, William, Market Place, Northallerton, Yorks.
1897, Nov. 13.	Rutherford, David, 16, Walker Terrace, Edinburgh.
1897, Nov. 13.	Short, Edward Marshall, 7, Stanton Street, Newcastle-upon-Tyne.
1897, Nov. 13.	Tait, Arthur Edwin, 13, Delaval Terrace, Waterloo, Blyth, Northumberland.

Examination Questions.

Practical Sanitary Science.—Newcastle-upon-Tyne, November 12th and 13th, 1897.

Paper I.

1. Explain the Hygienic importance of a knowledge of the Chemical and Physical Conditions of the Soil. How do Soils vary in composition physically and chemically, and what are the factors which govern these varieties in composition?

2. What is meant by "Natural" ventilation? Describe the "Plenum" system.

3. What is the composition of Ordinary Gas as used in lighting rooms? What is the nature and what are the amounts of the impurities which it yields to the atmosphere during combustion? Apply these facts to the requirements of ventilating dwelling-rooms lighted by coal gas, and state what provision should be made for dealing with them.

4. Describe the Biological Action of Sand Filtration on a large scale.

Paper II.

5. Why are Cellars undesirable as living-rooms? How can they be kept dry? Illustrate reply by sketches.

6. For what purpose are the following Timbers used in Building?—

Red or Yellow Deal.
Memel Fir.
English Oak.
Wainscot.
Pine.
Teak.
Mahogany.
Pitch Pine.

7. Give an exact Specification for the Soil Pipe of a Three-storied House having a W.C. on each floor, including the junctions with the closet and with the drain.

8. Explain the Construction of a Standard Mercurial Barometer, the method of reading it, and how corrections of the readings are made. If a Barometer, on being taken 900ft. up a hill, falls from 31 in. to 30in., show by calculation how much higher it must be taken to fall to 29in., the temperature being uniform throughout the observations.

The Candidates were examined vivâ voce *on the* 13*th.*

Inspectors of Nuisances.—Newcastle-upon-Tyne, November 12th and 13th, 1897.

1. Enumerate and describe the Conditions that would justify you in reporting to your Medical Officer of Health that you considered a house either (*a*) temporarily or (*b*) permanently unfit for human habitation.

2. What are the principal objections to Private Slaughterhouses? Give a brief Code of Regulations for their control.

3. What directions would you give as to Cleanliness and Disinfection on visiting a house in which was a Patient with Asiatic Cholera?

4. What are the provisions of the Rivers Pollution Prevention Acts, 1876 and 1893, as to Drainage into Streams from Manufactories and Mines? What powers and duties have Sanitary Authorities under these Acts as to Factories draining into Sewers?

5. The Water Supply to a detached house is to be derived from a well in pervious ground. Describe how it should be constructed to prevent surface pollution affecting the water. Make a sketch to illustrate the answer.

6. How many buckets full of water, each containing two and a half gallons, would be required to fill a 6in. Drain 30ft. in length.

7. Describe in detail how the Jointing and Fixing of Lead Soil Pipes should be done, and also the way to join Lead Pipes with Iron and with Stone Ware.

8. Describe the relative advantages and disadvantages of Heating by Hot Water at low pressure and by open fires.

The Candidates were examined vivâ voce *on the* 13*th.*

At an Examination in Practical Sanitary Science, held in London, on December 3rd & 4th, 1897, 9 Candidates presented themselves.

The following 4 Candidates were granted Certificates in Practical Sanitary Science:—

1897, Dec. 4. Chadwick, John, Bletchley, Bucks.
1897, Dec. 4. Collins William Alexander, 55, Forest Drive, West Leytonstone.
1897, Dec. 4. Smith, Frederick J. Osborne, 7, Old Queen Strret, Westminster, S.W.
1897, Dec. 4. Way, Tom Cherrill, 18, The Circus, Greenwich, S.E.

At an Examination for Inspectors of Nuisances, held in London, on December 3rd & 4th, 1897, 90 Candidates presented themselves.

The following 47 Candidates were certified, as regards their Sanitary Knowledge, competent to discharge the duties of Inspectors of Nuisances:—

1897, Dec. 4. Alexander, Arthur Edward, High Street, Fordingbridge, Hants.
1897, Dec. 4. Bant, Hubert, 68, Southgate Road, N.
1897, Dec. 4. Bonnett, William Henry, 28, Manor Lane, Lee, S.E.
1897, Dec. 4. Callow, Thomas, Gailey, Stafford.
1897, Dec. 4. Calnan, Arthur, 242, Commercial Road, E.
1897, Dec. 4. Child, Harry Robert, 91, Abbey Road, St. John's Wood.
1897, Dec. 4. Clark, George Frederick, 109, Antill Road, Bow, E.
1897, Dec. 4. Coleman, William, Church Road, Risborough, Sandgate, Kent.
1897, Dec. 4. Cook, James William, 28, Newman Street, W.
1897, Dec. 4. Davies, Miss Edith Emma Richards, Nurses Home, Hawards Road, Plaistow, Essex.
1897. Dec. 4. Emary, Frederick Stanley, 260, Harold Road, Hastings.
1897, Dec. 4. Freeman, Louis V., 102, Burdett Road, Bow, E.
1897, Dec. 4. Gibbs, William Henry, 126, Medway Road, New Brompton.
1897, Dec. 4. Green, Rowland, 134, Kingston Road, Oxford.
1897, Dec. 4. Griffiths, William Ebenezer, 109, Trinity Road, Upper Tooting, S.W.
1897, Dec. 4. Hedgcock, James Ernest, Finchdean, Horndean, Hants.
1897, Dec. 4. Hennen, George, 95, Fir Grove Road, Freemantle, Southampton.
1897, Dec. 4. Humphrey, William Thomas, 11, High Street, Fulham, S.W.
1897, Dec. 4. Hurst, George Frederick, The Woodruffs, Coalville, Leicester.

1897, Dec. 4.	Jenkins, Arthur, 170, Sunnyhill Road, Streatham, S.W.
1897, Dec. 4.	Jones, Thomas, 10, Hawarden Crescent, Swansea.
1897, Dec. 4.	Mandry, John Charles, 192, Camberwell New Road, S.E.
1897, Dec. 4.	Markham, Walter Ephraim, 79, Essex Road, Islington, N.
1897, Dec. 4.	Marsden, Rufus Edwin, 121, Lee Road, Blackheath.
1897, Dec. 4.	Michaelis, Miss Marie, 20, Charleville Mansions, West Kensington.
1897, Dec. 4.	Newton, Edward Arthur, 13, Meyrick Road, Clapham Junction, S.W.
1897, Dec. 4.	Newlyn, Harry, Vestry Hall, Cable Street, E.
1897, Dec. 4.	Norris, Henry John, 3, Brunswick Villas, Herne Bay.
1897, Dec. 4.	Roberts, Miss Dorothea Thornes, 26, Royal Crescent, W.
1897, Dec. 4.	Self, Frederick Blane, 17, Southboro' Road, South Hackney, N.E.
1897, Dec. 4.	Shera, Edward Lougheed, New Fishbourne, Chichester.
1897, Dec. 4.	Shillington, Miss Eleonora Henrietta, 30, Fitzroy Square, W.
1897, Dec. 4.	Simons, Georgeana, Miss, Argyle Villa, Argyle Road, Teddington.
1897, Dec. 4.	Smith, Thomas Herbert, 70, Eland Road, Lavender Hill, S.W.
1897, Dec. 4.	Smith, Walter, Pioneer-Sergeant, 3rd Grenadier Guards, Chelsea, S.W.
1897, Dec. 4.	Spears, Ernest Godwin, 48, Godwin Street, Birmingham.
1897, Dec. 4.	Spinks, Abraham, 122, Percy Road, Canning Town, E.
1897, Dec. 4.	Stark, Miss Hilda, Eccleston, Torquay.
1897, Dec. 4.	Streather, Edward, 2, Evelyn Street, Deptford, S.E.
1897, Dec. 4.	Swan, Edward Arthur, 74, Culverden Park Road, Tunbridge Wells.
1897, Dec. 4.	Taylor, William Thomas, 182, Burrage Road, Plumstead, S.E.
1897, Dec. 4.	Wakeford, Eliza, Mrs., 17, Arnold Place, Whetley Hill, Bradford, Yorks.
1897, Dec. 4.	Wall, John Alfred, 50, Uverdale Road, Chelsea, S.W.
1897, Dec. 4.	Walter, Edwin, 24 Uplands Road, Hornsey.
1897, Dec. 4.	Weeks, James Orchard George, 43, Montgomerie Road, Southsea.
1897, Dec. 4.	Weston Enoch, 32, Hambro Road, Streatham, S.W.
1897, Dec. 4.	Wood, Harry, St. Luke's Vestry, City Road, E.C.

Examination Questions.

Practical Sanitary Science.—London, December 3rd and 4th, 1897.

PAPER I.

1. What circumstances influence the mean annual temperature of a country? How does the variation in amount of aqueous vapour in the air affect the barometer? How is this aqueous vapour determined and how is it usually expressed?

2. Describe a rain gauge. What is meant by the expression "·75 inch of rainfall?" What is the average proportion of percolation and evaporation on chalk and gravel soils respectively?

3. What are the respective advantages, disadvantages, and dangers (if any) attendant upon the use, for warming rooms, of:—

(*a*) Open fires.
(*b*) Slow combustion stoves.
(*c*) Closed coke stoves.
(*d*) Gas stoves.

How may such disadvantages and dangers be best overcome or minimised?

4. What is meant by "hard" water? What are its physical characteristics? Describe methods of reducing the hardness.

PAPER II.

5. Name four impervious building materials. State in what positions they should be used, and why.

6. How would you make a secure foundation for a wall, 2 bricks thick, 50 feet high, and 30 feet long, upon chalk, stiff clay, gravel, and running sand, respectively? Draw the section of each wall and foundation to ½-in. scale.

7. Sketch and describe in detail the way to connect a water-closet with a soil pipe, including traps, ventilation, anti-siphon pipes, &c.

8. What are the chief considerations in laying out a system of town drainage:—

(*a*) For a hilly district.
(*b*) For a flat district.

The candidates were examined vivâ voce *on the 4th.*

Inspector of Nuisances.—London, December 3rd and 4th, 1897.

1. Permission to enter premises for the purpose of Inspection has been refused. What provision is laid down in the statutes to meet such a case?

2. What is the difference between a factory and a workshop?

What responsibilities have Sanitary Authorities and their Officers with regard to each?

3. There is a strong suspicion that the milk supplied by a certain town-dairy has been the cause of an outbreak of Typhoid Fever, mention the steps that you would take to ascertain if the milk has been exposed to any risk of contamination at the dairy in question.

4. What are the relative advantages and disadvantages of hot air and steam disinfections?

5. How many cubic feet of space per adult are necessary for:—

(*a*) A Fever Hospital,
(*b*) A Common Lodging House,
(*c*) An ordinary sleeping apartment.

Give a sketch of a Common Lodging House dormitory, 30 feet long × 20 feet wide, showing position of beds, doors, windows, fire-places, and ventilators. What height should this room be?

6. Describe in detail how a cistern for storing water in a dwelling-house should be constructed, and pollution of the water prevented; make sketches to shew the position of the cistern and of the various pipes connected with it.

7. What are the common causes of of dampness in houses? What remedial measures should be applied in each case?

8. Make sketches of and explain the best way to joint stoneware drains. How would you test both newly made and also old drains?

The Candidates were examined vivâ voce *on the 4th.*

At an Examination in Practical Sanitary Science, held in Manchester on December 17th and 18th, 1897, 6 Candidates presented themselves.

The following Candidate was granted a Certificate in Practical Sanitary Science:—

1897, Dec. 18. BENNETT, SAMUEL BARLOW, 5, Portland Grove, Fallowfield, Manchester.

At an Examination for Inspectors of Nuisances, held in Manchester on December 17th and 18th, 1897, 83 Candidates presented themselves.

The following 33 Candidates were certified, as regards their Sanitary Knowledge, competent to discharge the duties of Inspectors of Nuisances:—

1897, Dec. 18.	Allott, Frederick James, 5, School Street, Wombwell, near Barnsley.
1897, Dec. 18.	Andrews, John Henry B., 24, Valley Road, Anfield, Liverpool.
1897, Dec. 18.	Bailey, George, May Villa, Failsworth, Manchester.
1897, Dec. 18.	Bousfield, Harold, 54, Stramongate, Kendal.
1897, Dec. 18.	Callister, Robert, 14, Dacre Street, Liverpool.
1897, Dec. 18.	Campbell, Alfred, 61, Queen's Road, Harpurhey.
1897, Dec. 18.	Cannell, Robert Henry, 67, Robsart Street, Liverpool.
1897, Dec. 18.	Cargill, James Paulet, 58, Church St., Pendleton.
1897, Dec. 18.	Charles, Walter, 40, Blewitt Street, Newport, Mon.
1897, Dec. 18.	Christian, Frederick Cannan, 4, Mona Street, Myrtle Street, Liverpool.
1897, Dec. 18.	Corbridge, William, 14, Arnold Street, Bolton.
1897, Dec. 18.	Dearn, Allen Michael, 36, Corma Rd., Waterloo.
1897, Dec. 18.	Dyke, Charles Woodville, 15, Drayton Street, Everton, Liverpool.
1897, Dec. 18.	Fernley, James Thomas, Lane Ends, Marple Bridge, near Stockport.
1897, Dec. 18.	Field, James, 123, Victor Street, Sunderland.
1897, Dec. 18.	Greenup, Herbert, 22, Clarence Road, Chorlton-cum-Hardy, near Manchester.
1897, Dec. 18.	Handley, Richard Illingworth, 19, Blessington Road, Anfield, Liverpool.
1897, Dec. 18.	Hardy, John William, 46, Mersey Street, Hull.
1897, Dec. 18.	Irving, Hiram, 11, Jasmine Street, Liverpool.
1897, Dec. 18.	Jackson, Edwin, 19, Wilkinson Street, Leigh, Lancashire.
1897, Dec. 18.	Lanigan, John, 42, Brownbill Street, Salford.
1897, Dec. 18.	Marshall, James A., 55, Clarendon Road, Seacombe, Cheshire.
1897, Dec. 18.	Ormrod, John, 62, Chorley New Road, Bolton, Lancashire.
1897, Dec. 18.	Parker, William, 26, Newlands Street, Everton.
1897, Dec. 18.	Rocliffe, Miss Gertrude E., Ashfield House, Newcastle-upon-Tyne.
1897, Dec. 18.	Rogers, Frederick, 8, Kilnhurst Road, Todmorden, Lancashire.
1897, Dec. 18.	Sidebottom, Philip Kershaw, Alster Bank, Peel Causeway, Cheshire.
1897, Dec. 18.	Stoker, Joseph, Railway Avenue, Crook, *via* Darlington.
1897, Dec. 18.	Tyldesley, Martin, 129, Elliot Street, Tyldesley.
1897, Dec. 18.	Watson, Robert, 81, Boaler Street, Liverpool.
1897, Dec. 18.	Wharton, Herbert, 468, Oldham Road, Failsworth, Manchester.

1897, Dec. 18. **Wilcock, Edwin**, 20, Lime Grove, Didsbury, Manchester.

1897, Dec. 18. **Zanetti, Miss Frances**, 49, Elizabeth Street, Cheetham, Manchester.

Examination Questions.

Practical Sanitary Science.—Manchester, December 17th and 18th, 1897.

Paper I.

1. What do you understand by the term "Mechanical Equivalent of Heat?" Give a brief description of the ways in which its numerical value has been more or less accurately determined.

2. State the superficial area of the following solids:

Sphere, 7 ft. diameter.
Cone, 7 ft. diameter at the base by 10 ft. high.
Cylinder, 7 ft. diameter by 8 ft. high.

3. State briefly the merits and defects of lighting by gas, oil, and electricity, and describe the construction of—

a. An incandescent gas burner;
b. An electric arc lamp.

4. What is meant by the term "Watershed"? Describe the various sources of water supply, and their respective advantages or disadvantages.

Paper II.

5. In a reservoir what is meant by a "Head of Pressure?" and state the law which governs fluid pressure.

6. Name the following stones in the order of their durability: Bath, Huddersfield, Kentish Rag, Portland, Caen, Mansfield (white and red), and state any of their sanitary advantages or disadvantages for building purposes.

7. Give sections to a scale of 1½ in. to one foot of flooring to receive the following coverings:

1¼ in. Battens;
Wood Blocks;
Tiles;
Cement;
Granolithic Paving.

In what buildings would these various floors be advisable?

8. What is the relation between gradient, volume, velocity, and size in sewers?

The Candidates were examined vivâ voce *on the* 18*th.*

Inspectors of Nuisances.—Manchester, Dec. 17th and 18th, 1897.

1. What are the main provisions of the Model By-Laws of the Local Government Board for the conduct of the business of a slaughterer of cattle in Urban districts?

2. Describe the trades of Blood-boiling and Brick-burning. What precautions are necessary in each of these trades to prevent nuisance arising? and what powers have Sanitary Authorities to enforce these precautions?

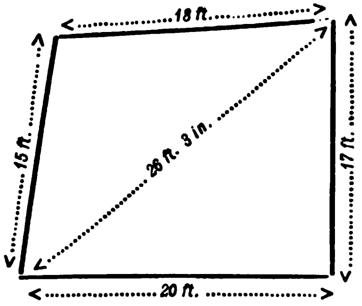
3. A case of Typhus fever is notified in a house in a crowded court. State what steps you would take as to—

a. Isolation of the patient;
b. Disinfection of the house and its contents.

4. State the several circumstances in which smoke may give rise to a nuisance, and the evidence you would require in order to institute a prosecution.

5. What is meant by natural ventilation and by mechanical ventilation? Describe briefly each system, with the relative advantages.

6. What is the cubical capacity of a room of the dimensions shown in the sketch plan, and 12 ft. in height? If in a common Lodging House, how many adults should sleep in it if properly ventilated?



7. Describe the best methods for purifying a suspected water supply, intended for dietetic purposes, after its delivery to a dwelling house.

8. Sketch and describe the construction of a good form of water-closet, with the position of the flushing cistern. State the size of the down-pipe, and the time that the flushing should take.

The Candidates were examined vivâ voce *on the* 18*th.*

FORTHCOMING MEETINGS.

Calendar, January to April, 1898.

As far as at present arranged.

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*Council Meetings are held Monthly on the Second Wednesday in each Month at 5 p.m., except August and September.

Special Purposes Committee	Third Monday at 5 p.m.
*Finance Committee	Second Wednesday at 4.30 p.m.
Exhibition Committee	First Tuesday at 5 p.m.
†Congress and Editing Committee	Second Monday at 5.15 p.m.
Museum and Library Committee	Fourth Monday at 5 p.m.
Parliamentary Committee	As occasion requires.

* Note.—*The April Meeting will be held a week earlier.*

† *The April Meeting will be held on the first Monday.*

FEBRUARY.

4 F. } 5 S. } Examination in Practical Sanitary Science and for Inspectors of Nuisances, Glasgow.

9 W. Sessional Meeting at 8 p.m. Discussion on Purification of Water for Barracks, Prisons, and other Institutions, to be opened by Prof. J. Lane Notter, M.A., M.D., D.P.H.

21 M. Introductory Lecture to Sanitary Officers at 8 p.m. Blots in our System of Sanitary Administration: Why Epidemics occur! by Louis C. Parkes, M.D., D.P.H.

24 Th. Lecture to Sanitary Officers at 8 p.m. Sanitary Law, English, Scotch, and Irish; General Enactments; Public Health Act, 1875; Model Bye Laws, &c., by Herbert Manley, M.A., M.D., D.P.H.

26 S. Inspection and Demonstration at Aylesbury Dairy Co.'s premises, Bayswater, at 3 p.m. (number limited).

28 M. Lecture to Sanitary Officers at 8 p.m. The Law relating to the Supervision of Food Supply, by A. Wynter Blyth, F.I.C., F.C.S., Barrister-at-Law.

MARCH.

2 W. Inspection and Demonstration in the Parish of St. George's, Hanover Square, at 2 p.m. Conducted by A. Taylor, Chief Sanitary Inspector.

3 T. Lecture to Sanitary Officers at 8 p.m. Sanitary Laws and Regulations governing the Metropolis, by A. Wynter Blyth, F.I.C., F.C.S., Barrister-at-Law.

4 F. } 5 S. } Examination in Practical Sanitary Science and for Inspectors of Nuisances, Exeter.

5 S. Inspection and Demonstration at the Sewage Works, Kingston-on-Thames, at 3 p.m.

7 M. Lecture to Sanitary Officers at 8 p.m. Trade Nuisances, by Prof. A. Bostock Hill, M.D., D.P.H.

9 W. Inspection and Demonstration on Disinfecting and Filtering Appliances.

9 W. Sessional Meeting at 8 p.m. Discussion on "Water-born Typhoid," to be opened by Christopher Childs, M.A., M.D., D.P.H.

10 Th. Lecture to Sanitary Officers at 8 p.m. •Objects and Methods of Inspection, Nuisances, &c., by J. F. J. Sykes, D.SC., M.D.

12 S. Inspection and Demonstration at the Friern Barnet Sewage Works, conducted by the Surveyor, E. J. Reynolds, A.M.I.C.E., at 3 p.m.

14 M. Lecture to Sanitary Officers at 8 p.m. Diseases of Animals in relation to meat supply. Characteristics of Vegetables, Fish, &c., unfit for food, by Alfred Hill, M.D., F.R.S., EDIN.

16 W. Inspection and Demonstration at L.C.C. Municipal Lodging House, Parker Street, Drury Lane, at 3 p.m., conducted by Frank Ruddle.

17 Th. Lecture to Sanitary Officers at 8 p.m. Infectious Diseases and Methods of Disinfection, by Henry R. Kenwood, M.B., D.P.H.

19 S. Inspection and Demonstration at Knacker Yard.

21 M. Lecture to Sanitary Officers at 8 p.m. Principles of Calculating Areas, Cubic Space, &c.; Interpretation of Plans and Sections to Scale, by J. Osborne Smith, F.R.I.B.A.

23 W. Inspection and Demonstration at the East London Water Works, Lee Bridge, at 3 p.m., conducted by the Engineer, W. B. Bryan, M.INST.C.E.

23 W. **Ordinary General Meeting at 5 p.m.**

23 W. Demonstration of Book-keeping as carried out in a Sanitary Inspector's Office, in the Parkes Museum at 7 p.m., by Albert Taylor, Chief Sanitary Inspector of the Vestry of St. George's, Hanover Square.

23 W. **Annual Dinner at 7.30 p.m.**

24 Th. Lecture to Sanitary Officers at 8 p.m. Water Supply, Drinking Water, Pollution of Water, by Prof. W. H. Corfield, M.A., M.D. (OXON.), F.R.C.P.

26 S. Inspection and Demonstration at the Ealing Electric Light Station, Refuse Destructor, Sewage Works, &c., at 2.15 p.m., conducted by the Engineer and Surveyor, Charles Jones, M.INST.C.E.

28 M. Lecture to Sanitary Officers at 8 p.m. Ventilation, Warming, and Lighting, by Joseph Priestley, B.A., M.D., D.P.H.

28 M. Inspection and Demonstration at the Metropolitan Cattle Market, York Road, N., at 3 p.m.

30 W. Inspection and Demonstration at Disinfecting Station, Lots Road, Chelsea, at 3 p.m., conducted by Louis C. Parkes, M.D., M.O.H.

30 W. Demonstration of Diseased Meat, at the Parkes Museum, at 8 p.m., by W. A. Bond, M.A., M.D., D.P.H.

31 Th. Lecture to Sanitary Officers at 8 p.m. Sanitary Building Construction, by E. T. Hall, F.R.I.B.A.

APRIL.

1 F. }
2 S. } Examinations in Practical Sanitary Science and for Inspectors of Nuisances, Birmingham.

2 S. Inspection and Demonstration at Morden Hall Farm, Morden, Surrey, at 3 p.m.

4 M. **Lecture to Sanitary Officers at 8 p.m. House Drainage, by W. C. Tyndale, M.INST.C.E.**

6 W. **Inspection and Demonstration in the Parish of St. Georges, Hanover Square, at 2 p.m., conducted by Albert Taylor, Chief Sanitary Inspector.**

6 W. **Sessional Meeting at 8 p.m. Discussion on The Desirability of making Water Shed Areas and Sanitary Districts coterminous, by R. E. Middleton, M.INST.C.E.**

6 W. **Meeting of Council.**

8-11. **Easter.**

ORDINARY GENERAL MEETING AND ANNUAL DINNER.

The Ordinary General Meeting is to be held on Wednesday, March 23rd, at 5 p.m., and it has been arranged to hold on the same evening the Institute Dinner. His Royal Highness the Duke of Cambridge, President, has graciously consented to take the Chair. Those Members and Associates who were able to attend the very successful Dinner held July last on the twenty-first anniversary, will be glad of this opportunity of again meeting together, and a large gathering is expected.

CONGRESS, 1898.

The City Council of Birmingham have invited the Institute to hold its Congress and Exhibition in that city in September next, and as this great centre of the Midlands offers such excellent opportunities for a large and influential meeting, there is little doubt that it will prove in every way a most successful Congress.

CONGRESS, 1899.

An invitation to meet in Southampton in 1899 has been sent by the Town Council. Seven years will have passed since the Institute met on the South Coast, and the Congress in this town will make a pleasant diversity from the Northern and Midland towns, and will also accomplish the object of spreading the meetings of the Institute widely over the country. As an important seaport, the town affords many points of interest in dealing with the various municipal sanitary problems.

MEMBERS AND ASSOCIATES ELECTED.

From October to December, 1897, inclusive.

(A complete list can be had on application.)

MEMBERS.

* Passed Examination in Practical Sanitary Science.

‡ Passed Examination as Inspector of Nuisances.

1122 1897. Oct. Aburrow, Charles, ASSOC.M.INST.C.E., *Town Engineer, Johannesburg, S. A. Republic.*

1125 1897. Nov. Barker, Joseph William, *Engineer's Department, Town Hall, Stratford, E.*

1126 1897. Nov. Barnes, Sidney Walter John, ASSOC.M.INST.C.E., *Surveyor, Hanwell District Council,* 19, *Denmark Road, Ealing.*

1123 1897. Oct. Barrow, Ernest G., *City Engineer, City of Hamilton, Ontario, Canada.*

1143 1897. Dec. Bayley, George Herbert, ASSOC.M.INST.C.E., *Craybrow, Lymm.*

1112 1897. Oct. Bretland, Josiah Corbett, M.INST.C.E., *City Engineer, Town Hall, Belfast.*

1144 1897. Dec. Clare, H. L., D.P.H., District M.O.H., *Kingston, Jamaica.*

1114 1897. Oct. *Cotterill, William Henry, 108, *The Chase, Nottingham.*

1117 1897. Oct. Crawford Lindesay, Charles de la Poire, ASSOC.M.INST.C.E., *Assistant Borough Engineer, Durban, Natal.*

1145 1897. Dec. Croole, John Rowland, ASSOC.M.INST.C.E., *Sanitary Surveyor, Hong Kong.*

1127 1897. Nov. Dixon, James Rush, ASSOC.M.INST.C.E., *Surveyor to Shoreditch Vestry, Town Hall, Old Street, E.C.*

1124 1897. Oct. *Farmer, Henry J., 27, *Sydenham Road, Bristol.*

1128 1897. Nov. Farquharson, Robert, M.D., M.P., *Finzean, Aboyne, N.B.*, and 2, *Porchester Gardens, W.*

1120 1897. Nov. Fraser, P., M.D., C.M., M.O.H., *Carnarvon Combined District, Craigydon, Carnarvon.*

1115 1897. Oct. Gould, Henry, *Assistant Engineer to the Water Commissioners,* 24, *Church Street, Kingston, Jamaica.*

1130 1897. Nov. *‡Gout, George, *Beilby House, Cleethorpes.*

1131 1897. Nov. *‡Hale, Edward John, *Mount Road, Mazagon, Bombay, India.*

1132 1897. Nov. Hembrough, John William, M.D., D.P.H., M.O.H., *Northumberland C.C., Moot Hall, Newcastle-upon-Tyne.*

1119 1897. Oct. Hughes, A. J., C.I.E., M.INST.C.E., F.S.S., *Chief Engineer, Calcutta, Bengal.*

1133 1897. Nov. Hunter, Edwin John, L.R.C.P., L.F.P.S., M.O.H., *Brookfield House, High Street, Gosport.*

1134 1897. Nov. Kemp, Ebenezer Walker, M.R.C.S., L.S.A., M.O.H., *Red Hill, Castleford, Yorks.*

1113 1897. Oct. Keywood, Horace Garibaldi, *Surveyor of Maldon, Market Hill, Maldon, Essex.*

1116 1897. Oct. *‡Knight, William Henry, 12, *Ferrestone Road, Hornsey, N.*

1135 1897. Nov. Manby, Edward Petronell, B.A., M.D., D.P.H., M.O.H., *Municipal Buildings, Liverpool.*

1120 1897. Oct. *‡Norton, John Barker, 1, *Old Court House Corner, Calcutta.*

1136 1897. Nov. O'Shaughnessy, Richard Gorman, ASSOC.M.INST.C.E., *Bazan Serai, Perak, Straits Settlement.*

1137 1897. Nov. *‡Parker, Howard, *Woodlands, Buxton.*

1138 1897. Nov. Parkinson, William, J.P., *Clevelands, Burnley.*

1147 1897. Dec. Peacock, Edwin, M.R.C.S., L.S.A., M.O.H., *Hazlemere, Coton Road, Nuneaton.*

1115 1897. Oct. Polak, Dr. Joseph, *Medical Officer of Health, City of Warsaw, Poland.*

1121 1897. Oct. Saunders, Charles, M.B., M.R.C.S., M.O.H., 29, *Romford Road, Stratford, E.*

1111 1897. Oct. Smith, Surg.-Capt. Frederick, D.P.H., *Army Medical Staff, Royal Victoria Hospital, Netley.*

1148 1897. Dec. Steele, Sidney Thomas, M.R.C.S., L.R.C.P.EDIN., D.P.H.CAMB., M.O.H., *Manor House, Morley.*

1149 1897. Dec. Storr, Frederick A., D.P.H.OXON., M.O.H., *Fern Place, Henry Street, Brighouse.*

1150 1897. Dec. Thomas John Tubb, D.P.H., M.O.H., *Alliance Chambers, Leicester.*

1130 1897. Nov. Thwaites, William, M.INST.C.E., M.A., *Melbourne, Victoria.*

1140 1897. Nov. Twelvetrees, W. Noble, 122, *Southwark Street, S.E.*

1151 1897. Dec. Wakeford, John Percy, ASSOC.M.INST.C.E., M.INST.C.E.I., *City Hall, Dublin.*

1152 1897. Dec. White, George, ASSOC.M.INST.C.E., M.INST.M.E., *Mexborough, Yorkshire.*

1153 7897. Dec. Wilde, Leonard, M.D., M.R.C.S., D.P.H., *Palace Chambers, Westminster.*

1141 1897. Nov. Williamson, Richard Ernest, M.B.&C.M.ED., L.R.C.P.&S.E., M.O.H., *Otley, Yorks.*

1142 1897. Nov. Wilson, John T., M.D., D.P.H., M.O.H., *Public Health Office, Hamilton, N.B.*

ASSOCIATES.

‡ Passed Examination for Inspector of Nuisances.

1644	1897.	Oct.	‡Bains, George S. L., *Boro' Surveyor's Office, Jarrow-on-Tyne.*
1648	1897.	Nov.	‡Buck, Samuel, *Pately Bridge, Yorks.*
1649	1897.	Nov.	‡Crocker, Jonas, *Blandford Forum, Dorset.*
1650	1897.	Nov.	‡Davies, Henry, 1, *Beech Street, Ferndale, R.S.O.*
1651	1897.	Nov.	‡Dean, James, 14, *Limefield Street, Accrington.*
1652	1897.	Nov.	‡Downs, F. J., *St. Agnes House, Newfoundland Road, Bristol.*
1653	1897.	Nov.	‡Eaton, Joseph, 5, *The Grove, Normanton, Yorks.*
1671	1897.	Dec.	‡Gardner, Thomas, 45, *Market Street, Ulverston.*
1654	1897.	Nov.	‡Glassup, Horace Mumphford, *Anglesea Road, Orpington, Kent.*
1655	1897.	Nov.	‡Gould, Henry Charles, *Monmouth Street, Topsham.*
1672	1897.	Dec.	‡Lindon, Alfred A., 91, *Warner Road, Walthamstow.*
1656	1897.	Nov.	‡Middleton, L. W., 11, *Valley Terrace, Shadwell Lane, Moortown, Leeds.*
1657	1897.	Nov.	‡Millard, George A., *High St., Chipping Sodbury.*
1658	1897.	Nov.	‡Mitchell, Herbert, *Fern Cottage, Odsall Moor, near Bradford.*
1659	1897.	Nov.	‡Morgan, Daniel, *Glenview Cwmgorse, Gwanncaegvwm, Glam.*
1660	1897.	Nov.	‡Potterton, Albert B., 122, *Cavendish Road, Balham, S.W.*
1661	1897.	Nov.	‡Pritchard, Charles William, 137, *Fowler Street, Sheffield.*
1662	1897.	Nov.	‡Rider, Thomas Frank, *Brettel Lane, Stourbridge.*
1063	1897.	Nov.	‡Robertson, Miss Monica, L. M., *Ladykirk, Harrow-on-the-Hill.*
1664	1897.	Nov.	‡Rushmer, J. Flowerday, *Lichfield Road, Southtown, Gt. Yarmouth.*
1646	1897.	Oct.	‡Smith, Robert, 11, *Whittaker Street, Radcliffe.*
1665	1897.	Nov.	‡Stewart, Robert Tomlinson, *Orsett, nr. Grays, Essex.*
1647	1897.	Oct.	‡Vaughan, John Oliver, 84, *Mayfield Street, Spring Bank, Hull.*
1645	1897.	Oct.	‡Walker, James Edward, 3, *Albert Terrace, Farnborough R.S.O., Kent.*
1666	1897.	Nov.	‡West, Horace George, *Avenell House, Avenell Road, Highbury, N.*
1668	1897.	Nov.	‡White, Newton, *Fairview, Canterbury Road, Folkestone.*
1667	1897.	Nov.	‡Whitehead, Thomas, *Springbank House, High Street, Lees, near Oldham.*
1669	1897.	Nov.	Whur, William, *Sanitary Inspector, Southend-on-Sea.*
1670	1897.	Nov.	‡Wilson, James, 2, *Rock Terrace, Hendon, Sunderland.*

OBITUARY.

SURGEON-GENERAL CORNISH, C.I.E.

(FELLOW.)

Perhaps no man did more in his time for the improvement of public health in India than the late Surgeon-General William Robert Cornish, who died at Worthing on the 19th ult., in the 70th year of his age. Born at Butleigh, near Glastonbury, in 1828, he received the rudiments of his medical education from local practitioners in Somersetshire, and on proceeding to St. George's Hospital, London, in 1850, he proved himself to be so well grounded in all branches of medical knowledge that he obtained a Scholarship in Anatomy and Materia Medica and prizes in Chemistry and Botany. His career at the Hospital was a brilliant one, and he closed it by gaining the appointment in the East India Company's Service, which that Company offered for competition amongst the students. He proceeded to Madras in 1854, as an Assistant Surgeon in the army of that Presidency, taking with him, as a part of his outfit for the public service, some most flattering testimonials from Sir Benjamin Brodie, Sir Prescott Hewitt, and other eminent surgeons and physicians of the day, who evidently held a high opinion of Mr. Cornish's abilities. On arrival at Madras, the young Assistant Surgeon went through the ordinary routine duty of medical officer to various regiments, being stationed for some time at Secunderabad. He soon began to make a name for himself in the medical literature of India, for in October 1856 he contributed a thoughtful article to the "Indian Annals of Medical Science" on the subject of "Indian Febrifuges," in which he gave the results obtained by him in the use of some common Indian febrifuges which were neglected by or unknown to ordinary English doctors. His experiments with Margosa bark went to show that Margosa was quite as effective in the treatment of intermittent fevers as the old established remedies cinchona and arsenic. At the time, the subject was of importance, as the supply of quinine from South America was showing signs of failing, and cinchona cultivation had not been established in India; though a few years later Cornish was one of the first to perceive that the cultivation of the plant would not only prove a success, but result in the export of large quantities of quinine from India, where the drug is still unused by the mass of the native population. The above article was followed by another on "Vegetable Astringents," giving the result of many interesting experiments, and showing much careful research into the old medical practice of India. In 1857 Assistant Surgeon Cornish was placed in medical charge of a large jail at Coimbatore. His attention was at once directed to the excessive mortality amongst prisoners, not only in this jail but throughout the country. The ordinary sanitary conditions of the old jails were bad, but they did not, in his opinion, account fully for the high mortality. After a careful examination he was able to show that a sentence of seven years was tantamount to a sentence of death to the average prisoner, and he was forced to the conclusion that this lamentable result was due partly to insanitary conditions and, to a greater extent, to the low scale of diet which was allowed to prisoners. His conclusions on the subject were embodied in a report on "Prison Dietaries and Food," which the Government allowed to be published; and there can be no doubt that it was this report which led to the remodelling of the jail system of the country. The late Sir B. W. Richardson, in his lectures on health, often referred to the author of this report as the greatest authority on Indian food grains and their chemical components. For an Assistant Surgeon of only four years service, the report was a remarkable production. Mr. Cornish's promotion now became rapid. In 1858, he was ordered down to Madras to act as Secretary to the Director General of the Medical Department. In connection with the duties of this office, he was directed to draw up a report on the causes of the excessive mortality amongst British troops serving in the Madras Presidency, for the information of the Army Sanitary Commission sitting in England. The first of these reports on the "causes of death in Madras" was for the year 1859, and it at once established Mr. Cornish's reputation as a sanitary authority, not only in India, but at the War Office at home. His own chief at Madras did not hesitate to advise his Government that, if they intended to appoint a Sanitary Commissioner or Registrar-General, "no better qualified officer for such important duty could be selected than Mr. Cornish."

The Madras Government directed that a summary of this report should be translated into the native languages, remarking that "such facts as the great preponderance of cholera among Mahomedans owing to their personal habits and the numerous burial grounds in their quarter of the town, and the serious loss of life among East Indians and Hindoos from small-pox, owing to their neglect of vaccination, cannot fail to attract attention and lessen that ignorance which renders the lower classes especially so regardless of sanitary precautions against disease."

The late Sir Ranald Martin, one of the members of the Army ment has been seeking for some time past to get a copy of the pamphlet from Madras, but it is now out of print in India. It seems, however, to have acquired fresh interest in view of the ravages caused by the plague in the Western Presidency.

Another subject to which Dr. Cornish gave prominent attention was the influence of soil in propagating disease. He pointed out that clayey soils and alluvium retain, for a long time, in an undecomposed form, "the exciting causes of cholera, typhoid fever, &c."; and he supported this theory with many practical proofs, which had come under his own observation. He concluded, therefore, that some soils had the property of retaining the elements of disease much longer than others; and he noted the comparative rarity of cholera on soils which have their origin and rest upon sedimentary laterite. This scientific fact, which was recorded before the bacteriologist appeared, has been of great practical value in India in the selection of sites for new barracks, jails, and other public buildings. In an article on "Typhoid Fever in the Madras Presidency," which he published in 1862, he showed how fallacious were the views of his medical brethren who held that enteric fever did not exist in India. "I take the present opportunity," he wrote, "of recording such additional facts as have come before me, and which tend to corroborate the view of Scriven, Goodeve, Ewart, Ranking, and others, that the destructive fever to which the name of typhoid has been applied by Dr. Jenner is by no means an uncommon disease in the European population of India."

Having served for twelve years as Secretary of the Medical Department, Madras, Dr. Cornish was in 1870 appointed Sanitary Commissioner to the Government. He now had an opportunity of carrying into practice those principles of sanitation which he had been advocating so earnestly and so successfully. As Sanitary Commissioner, it was part of his duty to travel over the Presidency, inspecting the conservancy arrangements and water supply in all the large towns and villages. There is no town of any importance in the Madras Presidency that he failed to visit, and there are few places that did not benefit in a sanitary way by his visits. The result of his work soon became apparent in the large reduction in mortality from cholera and small-pox; and it was noticeable that if cholera did break out in epidemic form in any locality, its spread to other localities was checked by the simple but effective sanitary arrangements he enforced in every district. Thirty or forty years ago, cholera was hardly ever absent from the city of Madras, and indeed the disease was long considered to be endemic there. But the improved water-supply that was introduced, on Dr. Cornish's recommendation, some twenty-five years ago, improved the health of the population in a marked degree, and banished cholera for months and even years together. If the disease appears now it is regarded as an epidemic, and dealt with accordingly. No Indian official was ever more popular with the Native population than Dr. Cornish, whose practical efforts to give them pure drinking water and save them from scourges like cholera and small-pox, were always appreciated, though the moral of his teaching was that cleanliness was a better safe-guard against such diseases than prayers to a Hindoo goddess! His ten years work as Sanitary Commissioner was undoubtedly fruitful of much good, and laid the foundation of a system of sanitary inspection which will do much in the future for the preservation of public health in India. In 1872, Doctor Cornish drew up the report on the Census made in 1871. He received a special honorarium of 5000 Rupees for this valuable work, which, in the opinion of Government, gave more reliable and detailed information about the population of the Madras Presidency than was ever before possessed. It is a most interesting and instructive volume, giving much curious information regarding the manners and customs of the people of Southern India.

During the great famine in 1877-8, Dr. Cornish rendered conspicuous service to the Madras Government, and was created a Companion of the Order of the Indian Empire for his labours in saving the lives of the famine-stricken population. The sound principles of famine-relief he laid down twenty years ago found a place in the Famine Code, and have had much to do with the success with which the present famine in India has been encountered.

In 1880, Dr. Cornish was promoted to the rank of Surgeon-General, and placed at the head of the Medical Department in Madras. Shortly afterwards he was made an Honorary Physician to the Queen, and appointed a member of the Legislative Council at Madras. In the latter capacity he took a prominent part in framing the Local Self-Government Bill for that Presidency, one of the most important pieces of Indian legislation of modern times. Dr. Cornish's intimate knowledge of the people and of their municipal requirements enabled him to give the Government valuable aid in framing this Bill, and when he left India, in 1885, after more than thirty years service, he was specially thanked by the Government, not only for the work he had done in his own department, but for the assistance he had rendered as a legislator in connection with this important Act.

Since his retirement from India, Surgeon-General Cornish had resided chiefly in London, where he has taken a prominent part in the organization of the Institute of State Medicine. He has also been a prominent member of the Council of the

British Medical Association, and an active member of the Committee of Management of St. George's Hospital.

He became a Member of the Institute in March, 1892, and was transferred to the Fellowship in February, 1894. Elected member of the Council March 20th, 1895, but resigned in February, 1896, owing to ill health.

L. F.

SIR HENRY DOULTON.

(Fellow.)

In the death of Sir Henry Doulton, which took place at his residence, Queen's Gate, on Wednesday, November 17th last, the country loses one of its most distinguished and successful manufacturers. Born in the Borough of Lambeth in 1820, he early became a member of the firm which had been founded by his father, in conjunction with Mr. Watts, and saw its growth from the time when only about a dozen hands were engaged to the present, when it numbers upwards of 4000 employés. His career shows the importance of masters having a thorough practical knowledge of their business. In his young days he took his place at the "wheel," became an expert "thrower," and made with his own hands the largest vessels at that time required for chemical purposes, to which in after years he often alluded with pride.

Among the many achievements in which Sir Henry Doulton was more personally interested were the making of drain-pipes in glazed stoneware, and the elevation of this ordinary material to its present artistic value. We look upon stoneware drain-pipes as absolutely indispensable for good work, but few now remember the enormous opposition with which they were at first assailed; on their introduction a bitter controversy raged in London, in which many of the most eminent engineers of the day took part; but, thanks mainly to the energy and determination of Sir Henry Doulton, all opposition was overcome, and the drain-pipe, as now known, has become a necessity in modern Sanitary Science. To this have been added many other allied industries, rendered necessary by the rapid advance of modern sanitation, all of which are carried on in one or other of various factories established throughout this and other countries. These facts show the wonderful business capacities required, especially when one remembers that the Sanitary portion is but one of the many distinct departments of manufacture carried on at Lambeth and elsewhere.

But perhaps the name of Sir Henry Doulton will be most widely associated with the Art productions of his firm, which date from 1870. Sir George Birdwood, writing in the Journal of the Society of Arts, says: "The influence of Sir Henry Doulton's example in the United Kingdom has been quite marvellous; this country now producing (and it has all been done since 1871) the most artistic commercial pottery in the world," and on these considerations he claims for Sir Henry Doulton the enduring gratitude and reverence of his fellow countrymen.

For such services as these, amongst many others, Sir Henry Doulton had the pleasure of receiving during his lifetime substantial evidences of appreciation. He was presented with The Legion of Honour by the French Government in 1878. In 1885 his services as pioneer in his country's industries was acknowledged by the award of The Albert Medal of the Society of Arts; the value of which was further enhanced by its being presented in person by H.R.H. The Prince of Wales, in December of the same year at the Lambeth Works, in the presence of many of the employés and friends; while in the Jubilee year of 1887 the further honour of Knighthood was conferred upon him.

Notwithstanding the onerous duties devolving upon the head of so extensive a business, Sir Henry Doulton very efficiently filled many public offices. Elected a member of the Society of Arts in 1851, he served several years on its Council, and was also among its Vice-Presidents. He was Deputy Lieutenant of the City of London, and took a very active part in the management of St. Thomas' Hospital, of which he was a Governor, and for some time chief Almoner.

We cannot better conclude this short notice than by quoting the words of H.R.H. The Prince of Wales, in a speech delivered at the presentation of The Albert Medal, already alluded to, showing at least one of the causes which brought about such successful conditions. Turning to the employés, His Royal Highness said: "Let me congratulate you on having at your head one who is capable of perceiving that the success of a manufacturer depends on his securing the hearty co-operation of those who work under his direction; and I congratulate your employer on the success which he has achieved in obtaining the best and most efficient aid in carrying out the beautiful industry in which you are all engaged. I sincerely trust that the kindly relations now existing among you may never be disturbed."

Sir Henry leaves one son and two daughters, and a large circle of friends, to deplore his loss.

EXHIBITS ADDED TO THE MUSEUM,

JUNE TO DECEMBER, 1897.

DIVISION A.

Geological Charts. Showing six vertical sections from Wells in the London Basin, including Kentish Town, Tottenham Court Road, Richmond, Streatham, Crossness, and Caterham.

Carbon dioxide Test. Dr. Cohen's apparatus for determining the amount of CO_2 in air. *Reynolds & Branson.*

DIVISION C.

Porcelain Enamelled Iron. Models of Baths, Lavatories, Sinks, Urinals, &c., made in this ware. *Cannon Hollow-ware Co.*

Soil Pipe. Specimens of two old soil-pipes with a 2-in. pipe connecting them, presumably for the purpose of preventing siphonage. *J. Hunter.*

Diagram (framed) of House Sanitation as practised in Italy. *J. Tylor & Sons.*

Disconnecting Trap, with rest for spirit level to facilitate the true fixing of the trap. *J. Duckett & Sons.*

London Sewage. Specimens of Crude Sewage; Effluent after Filtration; and various filtering and precipitating agents.

Moss Litter. Specimens of prepared, unprepared and packed material, the coarse being intended for Stable Bedding, and the fine for Earth Closets. *Hy. A. Ross.*

Gas Cooker. "The Hercules." Porcelain enamelled, with all parts movable and accessible for cleaning. *The Cannon Hollow-ware Co.*

DIVISION D.

Diseased Meat Specimens. Including Necrosis; Rickets; Joint-ill and Cisticerci in liver and heart of pig.

Lantern Slides. Sixty-nine slides, illustrating—

Sanitary Building Construction.
Cisterns, Wells, and Defective Water-supply arrangements.
Pollution of Drinking-water.
Street Washing.
Drain Laying.
Good and Bad forms of Sanitary Fittings & Appliances.
Drain Ventilation.
Household Sanitary Appliances.
Sewage Filters and Ejectors.
Composition of House Refuse, Sewage, and Street Mud.
Refuse Destructors.
Ventilators.

C. Mason, Assoc.M.Inst.C.E.

Lantern Slides. Twenty-six slides, illustrating details of Municipal Sanitation. *Purchased.*

NOTE.—*A complete list of the Lantern Slides that can be hired by Members and Associates may be had on application.*

CONTRIBUTIONS AND ADDITIONS TO LIBRARY

During October, November, and December, 1897.

⁂ *For publications of Societies and Institutions, &c., see under "Academies."*

ACADEMIES (American).

Philadelphia. *American Climatological Association.* Transactions, Vol. XIII., 1897. 250 pp., 8vo. Philadelphia, 1897. *The Association.*

ACADEMIES (British).

Glasgow. *Institution of Engineers and Shipbuilders in Scotland.* Transactions of. Vol. XL., Fortieth Session, 1896-97. 297 pp., 8vo. Glasgow, 1897. *The Institution.*

London. *Royal College of Surgeons.* Calendar, 1897. 330 pp., 8vo. London, July, 1897. *The Council of the College.*

——— *Royal Statistical Society.* Journal of. Vol. LX., Part III., September, 1897. 247 pp., 8vo. London, 1897. *The Society.*

——— *Royal Institute of British Architects.* Kalendar, 1897, 336 pp., 8vo. London, 1897. *The Institute.*

——— *City of London College.* Calendar, 1897-98. 199 pp., 8vo. London, 1897. *The College.*

——— *Guy's Hospital Medical School.* Calendar, 1897-98. 78 pp., 8vo. London, 1897. *The Dean.*

——— *University College.* Calendar, 1897-98. 460 pp., 8vo. London, 1897. *The College.*

——— *British Institute of Preventive Medicine.* Transactions. First Series. 163 pp., 8vo. London, 1897. *The Institute.*

——— *Incorporated Association of Municipal and County Engineers.* Proceedings, Vol. XXIII., 1896—97. 480 pp., 8vo. London, 1897. *The Association.*

——— *Institution of Civil Engineers.* Minutes of Proceedings, Vol. CXXX., 1896—97. Part IV. 422 pp., 8vo. London, 1897. *The Institution.*

——— *Medical Society of.* Transactions, Vol. XX. 375 pp., 8vo. London, 1897. *The Society.*

——— *St. Thomas's Hospital.* Reports. New Series, Vol. XXV., 1896. 618 pp., 8vo. London, 1897. *The Hospital.*

ACADEMIES (Continental).

Amsterdam. *Royal Academy of Sciences.* Verslagen van de Gewone Vergaderingen der Wis-en Natuurkundige Afdeeling van 30 Mei, 1896, tot 21 April, 1897. Deel V., 526 pp., 4to, Amsterdam, 1897. Deel V., No. 4, 39 pp., 4to., Amsterdam, 1896. Deel V., No. 6, 246 pp., 4to., Amsterdam, 1897. *The Academy.*

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Astronomer Royal. Results of the Magnetical and Meteorological Observations made at the Royal Observatory, Greenwich, in the year 1894, under the direction of H. M. Christie, M.A., F.R.S., Astronomer Royal. 198 pp., fp. London, 1897. *The Author.*

Bond, *F. T., M.D.* The Vaccination Problem. 38 pp., 8vo. Gloucester. *The Author.*

Bohm und Gohn. Die Müllverbrennungs—Derfuche in Berlin. 131 pp., 8vo. Berlin, 1897. *The Authors.*

Board of Agriculture. Annual Reports of Proceedings under The Diseases of Animals Acts, The Markets and Fairs (Weighing of Cattle) Acts, &c., &c., 1896. 101 pp., 8vo. London, 1897.

——— Agricultural Returns. Statistical Tables, showing acreage under crops and grass, and number of Horses, Cattle, Sheep and Pigs in the United Kingdom, with particulars for each County of Great Britain in 1897. 41 pp., 8vo. London, 1897. *The Board.*

British Columbia Provincial Board of Health. Second and Supplementary Reports for the year 1896. 4to. Victoria, 1897. *The Board.*

Brussels. *Exposition Internationale de.* Catalogue de la Section Internationale de l'Hygiène et des Arts Médicaux et Pharmaceutiques, 1897. 267 pp., 8vo. Bruxelles, 1897. *Dr. Hugo Kuborn.*

——— Rapports des commissions Médicales Provinciales sur leurs Travaux pendant l'année 1896, précédés des observations du conseil supérieur d'hygiène publique. 580 pp., 8vo. Bruxelles. *Ministère de l'Agriculture et des Travaux publics.*

Coleman, *T. E., F.S.I.* Stable Sanitation and Construction. 219 pp., 8vo. London, 1897. *The Author.*

Hart, *Ernest, D.C.L.* Influence of milk in spreading zymotic disease, a report on the. With a tabular analysis of forty-eight outbreaks. Reprinted from the *British Medical Journal.* 24 pp., 4to. London, 1897.

——— Waterborne Typhoid: A historic summary of local outbreaks in Great Britain and Ireland, 1853—1893. With a tabular analysis of 205 epidemics. A Report prepared for the Parliamentary Bills Committee of the *British Medical Journal.* 51 pp., 4to. London, 1897. *The Author.*

Hocking, *Rev. W. J.* The Church and Sanitary Progress. 15 pp., 8vo. London, 1897. *Rev. F. Lawrence.*

Japan. The Annual Report of the Central Sanitary Bureau attached to the Home Department of the Imperial Japanese Government for the 26th and 27th years of Meiji (1893-4). 228 pp., 8vo. Tōkyō, 1897. *Prof. W. H. Corfield, M.A., M.D.*

Kuborn, *Dr. Hyac.* Rapport à M. le Ministre de l'Agriculture et des Travaux des Sections du Congrès International d'Hygiène de Budapest, relatifs à l'alimentation, à l'habitation, à la legislation, et la police sanitaires et médicales. 88 pages, 8vo. Bruxelles, 1895.

Kuborn, *Dr. Hyac.* Aperçu Historique sur l'Hygiène Publique en Belgique depuis 1830. 284 pp., 8vo. Bruxelles, 1897. *The Author.*

Local Government Board. Twenty-fifth Annual Report, 1895-6. Supplement containing the Report of the Medical Officer for 1895-6. 305 pp., 8vo. London, 1897.

——— Dr. Theodore Thomson's Report on the conditions, topographical, geological and sanitary of the Havant Districts (Urban and Rural) in their relations with the sources of the Borough of Portsmouth Company's Water Supply. 29 pp., fp. London, 1897.

——— Dr. S. W. Wheaton's Report on Diphtheria in the Borough of Wrexham. 10 pp., fp. London, 1897.

——— Dr. F. St. George Mivart's Report on the sanitary circumstances of the Hayle and Phillack Urban Districts, and on Administration by the respective District Councils. 17 pp., fp. London, 1897.

——— Mr. Arnold Royle's Report on prevalence of diphtheria in Watford and Bushey. 7 pp., fp. London, 1897.

——— Twenty-sixth Annual Report, 1896—97. Supplement containing the Report of the Medical Officer. 308 pp., 8vo. London, 1897. *Sir R. Thorne Thorne, K.C.B., F.R.S.*

Macassey, *L. L.* Hints on the Water Supply of Small Towns and Villages. 112 pp., 8vo. London, Dublin, and Belfast, 1877. *Mrs. Topley.*

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NOTES ON LEGISLATION AND LAW CASES.

Prepared by Dr. H. Manley, M.O.H., West Bromwich.

QUEEN'S BENCH DIVISION.

(*Nov. 6th*, 1897.)

Before Mr. Justice Wright and Mr. Justice Kennedy.

BAKER *v.* WILLIAMS.

Dairies and Cowsheds Order, 1885. *Cubic Space—Validity of Bye-Law.*

This was a special case stated by Magistrates for the Borough of Southport, raising the question as to the validity of a bye-law or regulation made by the Mayor and Corporation of Southport, providing that in cowsheds in the Borough there must be 800 cubic feet of free air-space for each animal. The appellant, a dairyman and cow-keeper, had been convicted for contravening the regulation, which purported to be made under the Contagious Diseases (Animals) Act, 1878, and the Dairies, Cowsheds, and Milk Shops Order of 1885, and was dated April 8th, 1890. It was contended—(1) that the regulation in question was one that could not be made by the Mayor, Aldermen, and Burgesses as the local authority under the Order of 1885; (2) that the word "ventilation" in the 13th section of such Order did not authorise any regulation with regard to the quantity of air space (3) that the provisions of section 34 of the Contagious Diseases (Animals) Act, 1878, did not, nor did section 9 of the Act of 1886, or any other provision of either Act authorise the making of any Order of the Privy Council regulating air space or free air space; and that, therefore, in so far, if at all, as the Dairies, Cowsheds, and Milk Shops Order of 1885 imposed any restrictions as to air space, or purported to authorise the making of any regulations by the local authority as to air space, such Order was invalid.

Mr. Moulton, Q.C., for the appellants, contended that the power given to make regulations with regard to ventilation of cowsheds did not include that of making regulations as to the amount of air space. Ventilation and air space were entirely distinct things. Cattle in a cattle truck on a railway have plenty of ventilation, though they were packed as tight as they could stand. The Order in Council was ultra vires and the rules were nullities. He cited the "Institute of Patent Agents v. Lockwood (1894) (H. L.)."

Mr. MacMorran, Q.C., for the respondents, contended that the Order in Council included, and rightly included, provisions for air space as well as ventilation. Therefore, the Borough authority was entitled to make regulations in respect thereof. He cited "Ex parte Kingston" (18 L.R., Ir., 509); "Ex parte Foreman" (18 Q.B.D., 393); "Reed v. Parvell" (5 Q.B.D., 186).

The Court upheld the validity of the bye-law.

Mr. Justice Wright said that by section 34 of the Contagious Diseases (Animals) Act, 1878, the Privy Council were empowered to make Orders subject to the provisions of the Act for the lighting, ventilating, cleansing, and water supply of cowsheds and dairies, and for authorizing a local authority to make regulations for the purposes aforesaid. By section 58 such an Order was to have the effect of an Act of Parliament. In 1885 the Privy Council made an Order under the Act. By section 7 of that Order it was provided that it should not be lawful for a cowkeeper to begin to occupy a dairy or cowshed unless he first made provision to the reasonable satisfaction of the local authority "for the lighting and the ventilation, including air space and the cleansing," &c., of the same. By section 8 it was provided that it should not be lawful for a cowkeeper to occupy any cowshed, whether old or new, "as long as the lighting and the ventilation, including air space and the cleansing," &c., were not such as were proper. By section 13 (*b*) a local authority had power granted to make rules for "regulating the lighting, ventilating, cleansing, drainage, and water supply of dairies and cowsheds." The question was, Did those words give the power to the local authority to make regulations for air space as well as ventilation? It was rather strange that air space should be included in section 7 and 8 and not in section 13. The Order under the Act was to have the effect of an Act of Parliament. What was the effect of that? The case cited about the Institute of Patent Agents showed that, in such a case, the order and statute should be read together. Following that principle, there was no inconsistency in interpreting section 13 of the Privy Council Order as giving power to the local authority to make regulations in respect of "ventilation and air space."

Mr. JUSTICE KENNEDY concurred. This was a case of a conviction for breach of the regulations as to cowsheds. The regulation was said to be ultra vires. It seemed to the learned Judge that there was nothing wrong in a Privy Council Order under the Act dealing with air space. In fact, they had provided for air space as well as ventilation for all dairies and cowsheds, both old and new, though it was difficult to see why in sections 7 and 8 ventilation and air space were included and not in section 13. The decision of the magistrates was right.

GENERAL NOTES.

THE WEBER-PARKES PRIZE AND MEDALS.—In December 1894 Dr. Hermann Weber offered to the Royal College of Physicians of London, a sum of £2,500, afterwards increased to £3,000, to found a prize in memory of the late Dr. Edmund Alexander Parkes, and for the promotion of the study of the etiology, the prevention, the pathology, the cure, or the treatment of tuberculosis. The gift was gratefully accepted by the College, and regulations were drawn up and issued in January 1895, providing that the prize, amounting to £150, should be awarded triennially, that a bronze medal should be given to the recipient of the prize, and a similar medal, to be distinguished as the second medal, to the essayist who came next in order of merit.

The dies for the medal, which, as will be seen from the accompanying illustration, is a work of very great artistic merit, were prepared under the direction of the founder of the prize, who is well known as an amateur of this beautiful form of art, by Mr. Frank Bowcher, of Camden Town. The obverse presents an admirable portrait of the founder Dr. Hermann Weber, in profile, whilst the reverse of the medal represents Asklepios seated, with Demeter, Apollo, and Herakles standing before him. The idea is that the physician (Asklepios) avails himself of the powers of Nature in preventing and

curing pulmonary tuberculosis. He requires for these purposes food supplied by Demeter; light and warmth by Apollo, the Sun and promoter of growth, the destroyer of injurious microbes; and, further, purity of air and muscular force represented by Herakles. The inscription on the reverse reads, "The Prevention and Cure of Tuberculosis." The figures are taken from Greek sculptures and coins of the best period of Greek art. The name of the recipient is engraved on the edge of the medal.

The first award was made on St. Luke's Day, October 18th, 1897; the subject previously announced as that upon which the essays were to be written was "The Means, Prophylactic or Curative, deemed by the Author to have Value in the Control of Tuberculosis, especial regard being had to their application to Human Tuberculosis." The writer of the best essay was Dr. Arthur Ransome, of Bournemouth, who received the prize and medal, while the second medal was awarded to Dr. Peter Paterson of Glasgow. The President in making the award said that the number of essays sent in had been considerable, and that some of them were of great value.

NOTE.—The Institute is indebted to the Editor of the "British Medical Journal" for the loan of the blocks from which the illustrations are printed.

GENERAL INDEX.

PAGE

ACIDULATED ashes, treatment of crude night soil with, by Herbert Jones 25

Act, the difficulties and duties of the Medical Officer of Health under the Notification of Infectious Diseases, by William Berry.......................... 21

„ for the housing of the working classes in Edinburgh, the operation of the 478

„ the operation in Leeds of the housing of the working classes, by George F. Carter 465

Acts dealing with factories and workshops..... ... 34, 37, 349

„ dealing with public water supplies................. 10, 11

„ Sanitary, passed within the last fifty years.............. 285

Adams, R., on Dr. Waldo's paper 88

Address to H.M. the Queen from the Sanitary Institute........... 216

Adeney, Walter E., contributions to sewage purification literature............... 532

„ methods of investigation on polluted waters 533

„ considerations involved in examining his experimental results 534

„ methods summarised 540

„ on investigations by 587

Advertisement, some Sanitary aspects of, by Dr. R. Sydney Marsden............................. 434

Aërobic and anaërobic systems, results of working 543

Air Pollution in towns, by J. B. Cohen 607

PAGE

Aldehyde vapours, experiments in disinfection with............413, 421

„ „ various methods and apparatus for generating, and their relative advantages 408, 410

Allan, G. A., on Dr. Waldo's paper 89

Alumino-ferric blocks, Spence's.. 550

Ammonia free in sewage 547

„ organic in effluent........... 547

„ organic in sewage 547

Analysis of sewage 546

„ interpretation of results ... 547

Anaërobic liquefying bacteria action on sludge 548

Andrews, Capt. C. W., on E. T. Hall's paper 510

Anningson, Dr., on the papers by Dr. Wilson and Dr. Thresh 623

„ on J. B. Cohen's paper 610

Angell, Lewis, address to section II. by 280

„ „ on papers on sewage disposal...... 576, 586, 588

„ „ on E. T. Hall's paper... 512

„ „ on A. Lupton's paper... 518

Annual Report of the Council of Sanitary Institute for 1896...... 115

Anti-rabic serum treatment, description of the 15

„ Treatment at the Pasteur Institute, description of the 13

„ Vaccinations at the Pasteur Institute from 1886 to 1895 (inclusive), tables showing the results of the............................. 16

Architecture and Engineering ... 280

PAGE

Armstrong, Dr. H. E., on Dr. Kenwood's paper 179

Armytage, W. K L., on papers on sewage disposal 585

Ashpits, the disposal of household refuse, and the improper use of, by Miss de Sumichrast Roussey 54

Associates and members elected in 1897............ 142, 246, 380, 650

Aston, Dr. on Dr. Bond's paper 460

„ on Mr. Carter's paper 476

„ on Dr. Kaye's paper 486

„ on Mr. Kent's paper 490

Atmospheric oxygen, importance of, to fermentative changes in sewage purification 536

„ „ system adopted for supply of 536

Awards, list of, at the Leeds Exhibition, 1897 369

BACILLUS of Diphtheria, its behaviour outside the human body, by Prof. E. F. Trevelyan 430

Bacteria, the purification of sewage by, by Samuel Rideal 59

„ and sewage purification ... 577

„ beds (sewage filters), regulation of quantity and times for charges with sewage 544

„ growth of and disintegration of sewage 581

Bacterial fermentation, products of, in foul water............ 535

„ filtration of sewage 548

„ treatment of sewage ...531, 586

„ treatment of sewage, anaërobic and aërobic 543

Bacteriological report by H. J. Curtis, being appendix 1. to Dr. Kenwood's paper 412

Bacteriolysis or carbon oxidation first stage of fermentation ... 537

Bainton, John, on the papers by Dr. Wilson and Dr. Thresh 620

Baker, Councillor G. F., on papers on sewage disposal 578

Barwise, Dr. S., on papers on sewage disposal 587

„ on the purification of sewage 545

Baths and Lavatories on ocean steamers and warships 46, 47

Beeston, C. S., on papers on sewage disposal 588

Berlin Sewage Farm 577

PAGE

Berry, William, on the difficulties and duties of the medical officer of Health under the notification of Infectious Diseases Act 21

Beveridge, Dr. A. T. G., on Dr. Bond's paper 457

„ on Mr. Carter's paper...473, 479

Bibliography consulted in connection with Dr. Kenwood's paper 415

Billing, G. T., on our meat and milk supply, and the law relating thereto 39

Biological Filters...................... 588

Blackham, James, on E. T. Hall's paper 507

Bland, William, on sanitary work in rural districts 31

Blyth, A. Wynter, lecture on the education, status, and emoluments of sanitary inspectors... 189

Bombay, table showing the death rate for the years 1891 to 1895 (inclusive) in........................ 102

Bond, Dr. F. T., on Prof. Trevelyan's paper............... 430

„ on the report of the Royal Commission on vaccination 438

Boobbyer, Dr. P., on Dr. Kenwood's paper 183

„ popular lecture to the Leeds Congress, 1897, by 389

Books, reviews of 110, 200, 634

Boulnois, H. Percy, lecture to the Congress at Leeds, 1897, by ... 358

Boulton, Alderman, on J. B. Cohen's paper 610

Branson, G., on C. H. Tattersall's paper 633

Brown, Councillor, W. S., on Mr. Carter's paper 477

Brown, Dr. G., on Dr. Kenwood's paper 186

„ on the papers by Dr. Wilson and Dr. Thresh 622

„ on C. H. Tattersall's paper . 633

Buisson treatment for hydrophobia.................................. 15

Buxton, experimental filters at, analysis of results 554

CAMERON, Dr. J. Spottiswoode, on Dr. Bond's paper 458

„ on disinfectants 397

Cameron, D., on Dr. Rideal's paper 80

„ on a year's experience of the septic tank system of sewage disposal at Exeter 562

PAGE
Cancer, are coal-miners exempt from, by Dr. Thomas Oliver ... 20
Carbolic acid as a disinfectant 400, 424
Carbonic acid gas in the air of septic tank, and amount of carbonic acid found in tank, tables showing 66
„ produced in an empty filter, table showing amount of 73
Carter, George F., on the operation of the housing of the working classes act in Leeds... 465
Carter, Rev W. L., on C. H. Tattersall's paper 633
Cass, T. Foley, on the duties of sanitary authorities in relation to factories, workshops and shops 33
Cement jointing and clay jointing of pipes, objections against 23, 24
Chemical constituents and varieties of foods, table showing the chief 390
Chemistry, Meteorology, and Geology 304, 591
Children, some points of consideration in the hygiene of, by Mrs. Mather 53
Childs, Dr., on the papers by Dr. J. S. Cameron, Prof. Delepine, Dr. H. R. Kenwood, and Mr. Wolf Defries 424
China, river water in, purity of 323
Chloride of Lime as a disinfectant..........................401,403, 423
Chlorine in sewage 547
„ index of strength in domestic sewage............... 547
Clare, Dr. J., on Dr. Bond's paper 455
Clarification of sewage 550
Clarke, Dr. Thomas, on port sanitary regulations, and preventive measures................. 49
Clay jointing and cement jointing of pipes, objections to... 23, 24
Closets and latrines on ocean steamers and war ships 45
Coal, action of, as a filtering medium 556
„ compared with coke breeze and ballast for sewage filters 558
„ filters, details of construction, by Mr. Garfield...... 556
„ effluents from, albuminoid ammonia in 552
„ results of experiments on effluent from, at Lichfield and Wolverhampton...... 556

PAGE
Coal, filtration of sewage through, by Prof. A. Bostock Hill. 554
„ power of, for removing putrescent organic matter from sewage 557
Coal-miners, are they exempt from cancer, by Dr. Thomas Oliver 20
Cohen, J. B., on air pollution in towns 607
Colliery villages, sewerage and sewage disposal of, by J. E. Parker 29
Collingridge, Dr. W., on sanitation on board ship 40
Compston, Alderman, on papers on sewage disposal 557
„ on Prof. Trevelyan's paper. 432
Commemorative dinner to celebrate the twenty-first anniversary of the foundation of the Sanitary Institute 218
Construction of fever hospitals, by Edwin T. Hall 491
Control and supervision of public water supplies by sanitary authorities, by Dr. Charles Porter................................ 10
Cooper, C. H., on Dr. Rideal's paper 79
Corfield, Prof. W. H., on Dr. Kenwood's paper......... 178
„ on Dr. Rideal's paper 76
Cornish, Surgeon-Genl., Obituary 653
Crowther, Henry, on a decade of sunshine observations at Leeds 601
Croydon, an account of an outbreak of rabies in the county borough of, in the autumn of 1895, and an outline of the anti-rabic treatment by inoculation at the Pasteur Institute, by Leonard Wilde 12
Crude night soil, treatment with acidulated ashes of, by Herbert Jones 25
Curtis, H. J., bacteriological report, by, being Appendix I, to Dr. Kenwood's paper 412
Cycling for ladies, aspects of, by E. B. Turner 50

DAVIS, Miss J. S., on the value of teaching hygiene and sick nursing to working women ... 52
Death-rate in Bombay for years 1891 to 1895 (inclusive) 102

PAGE
Death-rate per 1000 persons in England and Wales from 1851 to 1895, from the seven chief zymotic diseases, table showing annual ... 161
„ from hydrophobia among persons bitten by alleged rabid animals. French Board of Health, 1862-72 15
„ in Leeds from 1865 to 1896, average ... 332
Definition of sewage ... 545
Defries, Wolf, on notes on the examination of disinfectants ... 416
„ on papers on sewage disposal ... 585
Delepine, Prof. S., on disinfection 402
Derbyshire County Council, provisional standard of purity for effluents ... 547
Diarrhœa and infectious diseases caused and transmitted by milk 4
Dibdin, W. J., and G. Thudichum, on scientific basis of sewage treatment .. 541
„ „ on papers on sewage disposal ... 581, 586
„ „ on Dr. Poore's paper .. 530
„ „ on P. F. Kendall's paper 600
Dick, James, on Dr. Bond's paper 455
Dickson, H. N., on J. B. Cohen's paper ... 610
Diphtheria bacillus outside the human body, the behaviour of the, by Prof. E. F. Trevelyan ... 430
Diplomas in sanitary science, Public Health, etc, granted in 1893, 1894, and 1895 ... 344
Disinfectants, by Dr. J. Spottiswoode Cameron ... 397
„ notes on the examination of, by Wolf Defries ... 416
„ tables showing results of experiments with certain 417
Disinfection apparatus for rural hospitals ... 9
„ by Prof. S. Delepine ... 402
„ of rooms by formic aldehyde vapours, by Henry Kenwood ... 406
„ of sewage, attempts to, deprecated ... 548
Disposal of household refuse, and the improper use of ashpits, by Miss de Sumichrast Roussey ... 54
„ house refuse at Liverpool ... 360

PAG
Disposal, sewage of colliery villages, by J. E. Parker ... 2
„ of refuse in a mining village, by Arnold Lupton .. 51
Domestic Hygiene, conference of ladies on, at the Congress at Newcastle-on-Tyne, 1896 5
„ „ conference of ladies on, at the Leeds Congress, 1897, address by Mrs. Fawkes, to the ... 35
„ sewage, chlorine in, index to strength ... 54
„ slop-water in isolated houses, treatment of, by Dr. G. V. Poore ... 51
„ slop-water, composition of 52
Dortmund tank, advantages of ... 55
„ „ patent rights of ... 58
„ „ construction of, and system of working and cost of process 55
„ „ analysis of results at Ilkeston ... 55
Doulton, Sir Henry, Obituary ... 66
Drainage construction, improved methods of, by F. C. Lynde 3
„ in fever hospitals ... 50
Drain pipes, objections against cement and clay jointing of 23, 2
Drain and sewer pipes, jointing of by R. S. Rounthwaite ... 2
Ducat's, Col., filter, construction of 54
Dupré, Miss, on teaching of housewifery in elementary schools ... 5
Dwellings, temporary for public works, by R. W. Newman ... 51

EASTBOURNE, water supply at 31
Eastern hill region in Yorkshire, description of the rocks in the 59
Edinburgh, operation of the Housing of the Working Classes Act in ... 47
Education, hygiene in elementary, by James R. Kaye ... 48
Effluents, conditions to be fulfilled by ... 54
„ Derbyshire County Council standard of purity ... 54
„ organic ammonia in ... 54
Elementary schools, teaching of housewifery in, by Miss Dupré 5
Engineering and architecture ... 28
„ some sanitary advances in municipal ... 35

PAGE

Engineers, conference of municipal and county, at the Leeds Congress, 1897, Address by Thos. Hewson 345
„ „ at the Congress at Newcastle-on-Tyne, 1896 .. 22
England, enormous advance during the Victorian Era of sanitation in 336
„ Swedish gymnastics in, by Miss Ruth Raeburn 52
Enteric fever at Maidstone, 1897, caused by polluted water 316
Executive sanitary officers, necessity for efficient 297
Exeter filter beds, description of the 72
„ Tables I. to IV. shewing septic tank filtration at... 64
„ a year's experience of the septic tank system of sewage disposal at, by Donald Cameron 562
„ system of bacterial sewage treatment at 543
„ septic tank 548, 578
Exhibition at Leeds, list of awards 369
Exhibits added to the museum 147, 249, 663

FACTORIES and workshops, necessity for better ventilation in 352
Factories, workshops, and shops, the duties of sanitary authorities in relation to, by T. Foley Cass 33
Factory and Workshop's Acts 34, 37, 349
Fairley, F., on P. F. Kendall's paper 599
Farquharson, Dr. on Dr. Bond's paper 454
„ Inaugural address to the Congress at Leeds 1897, by 257
„ on Dr. Waldo's paper 88
Fawkes, Mrs address to the conference of ladies on domestic hygiene at the Leeds Congress, 1897, by 357
Fellows, members, and associates elected in 1897...142, 246, 380, 650
Fever hospital construction, by Edwin T. Hall 491
„ hospitals, ward accessories in 501
„ „ drainage in 506

PAGE

Filter beds at Exeter, description of the 72
„ experiments dealing with sewage, table showing result of 71
Filters, action of bacteria upon... 544
Filtrates from filter beds, self-purification in 75
Filtration, intermittent or irrigation 548
„ gutters, figures III. and IV., illustrating 526
„ of sewage....................... 579
„ „ through coal, by Prof. A. Bostock Hill 554
Flower, Major Lamorock, address to the Conference on river pollution by 317
Foods, table of the chief chemical constituents and varieties of... 390
Forman, Dr. E. B., on Dr. Kenwood's paper........................ 187
Formic aldehyde vapours, the disinfection of rooms by, by Henry Kenwood 406
„ „ various methods and apparatus for generating, and their relative advantages 408, 410
Fraser, Alderman Evan, on the, sanitary inspection of ships ... 49
Free ammonia in sewage 547
Fyfe, Peter, address to the Conference of Sanitary Inspectors at the Leeds Congress, 1897, by 347

GALTON, Sir Douglas, on Mr. Latham's paper..................... 104
Garfield, Mr., on filtration through fine coal 555
General notes 158, 255, 388, 671
Geological survey map, importance of the revision of the...... 310
Goddard, Miss, on Dr. Waldo's paper 88
Green, Mr. R. B., on Dr. Waldo's paper 90
Griffith, Major on Dr. Bond's paper 453

HARRIS, A. Wellesley, on port sanitary administration 49
Hall, Edwin T., on fever hospital construction 491

PAGE

Hall, John, on E. T. Hall's paper 511
Harrison, Alderman, on Mr. Carter's paper 480
Hendon, Colonel Ducat's method of dealing with sludge at 549
Hewson, Thomas, address to the conference of municipal and county engineers at the Leeds Congress, 1897, by 345
Hill, Prof. Bostock, on Dr. Kenwood's paper 182
„ on the filtration of sewage through coal 554
„ on papers on sewage disposal 588
Hill, Dr. Eustace, on A. Lupton's paper 517
Hime, Dr. T. W., on Dr. Bond's paper 462
Holmes, R. S., on suggested amendments on port sanitary law 49
Holt, Mainwaring, on Dr. Marsden's paper 438
Homersham, Miss, on Dr. Waldo's paper 89
Hospital construction, fever, by Edwin T. Hall 491
Hospitals, disinfection apparatus for rural 9
„ isolation for rural districts, by Roger McNeill 7
Household refuse, disposal of, and the improper use of ashpits, by Miss de Sumichrast Roussey... 54
House sanitation, the cardinal conditions of 289
Houses, our, by Councillor Manson 54
„ for the working classes in Leeds, description of proposed 468, 470
Housewifery in elementary schools teaching of, by Miss Dupré ... 55
Housing of the labouring classes, necessity for the better 363
Housing of the Working Classes Act, its operation in Edinburgh 478
„ „ in Leeds, operation of the, by Geo. F. Carter 465
Housing of the working classes, the importance of the proper... 291
Hunter, Sir Guyer, on Mr. Latham's paper 108
Hydrophobia, death rates from, among persons bitten by alleged rabid animals, French Board of Health, 1862-72 15

PAG
Hygiene of children, some points of consideration in the, by Mrs. Mather 5
„ in elementary education, by James R. Kaye 48
„ in relation to the physical development of women, by Miss G. Rocliffe......... 5
„ of schools, by Arthur Kent . 48
„ in schools of the upper middle classes, on the teaching and practice of, by Mrs. White Wallis ... 5
„ some essentials of popular.. 38
„ the value of teaching it, and sick nursing to working women, by Miss J. S. Davis.......................... 5

INAUGURAL address to the Congress at Leeds, 1897, by Robert Farquharson 25
Income and expenditure of the Institute for 1896, statement of 13
India, defects of sewerage in...... 9
„ density of population in large towns in 9
„ necessity for a pure water supply in 10
„ sanitary work influenced by the rainfall in 9
Indian sanitation, by Baldwin Latham 9
Infectious Diseases Act, the difficulties and duties of the medical officer of health under the notification of, by William Berry 2
Inspection, sanitary, of ships, by Alderman Evan Fraser 4
Inspectors, conference of sanitary, at the Leeds Congress, 1897, address by Peter Fyfe, to the 34
„ „ Congress at Newcastle-on-Tyne, 1896.................. 3
„ the education, status, and emoluments of sanitary, by A. Wynter Blyth 18
„ necessity for the union of sanitary 35
Institute, commemorative dinner to celebrate the twenty-first anniversary of the foundation of The Sanitary 21
Intermittent filtration or irrigation 54

PAGE

Interpretation of results of analysis ... 547

Irrigation or intermittent filtration ... 548

Isolated houses, treatment of domestic slop-water in, by G. V. Poore ... 519

Isolation hospitals for rural districts, by Roger McNeill ... 7

JOHNSTONE, Dr., on Dr. Kenwood's paper ... 185

Jones, Lieut.-Col. A. S., on Dr. Rideal's paper ... 79

„ on papers on sewage disposal ... 582

Jones, Herbert, on treatment of crude night soil with acidulated ashes ... 25

KAYE, James R., on hygiene in elementary education ... 482

Kendall, Percy F., on the rocks of Yorkshire as a source of water supply ... 591

„ on the papers by Dr. Wilson and Dr. Thresh ... 621

Kent, Arthur, on school hygiene 488

Kenwood, Henry, on the disinfection of rooms by formic aldehyde vapours ... 406

„ on Dr. Kaye's paper ... 485

„ on the notification of measles ... 161

LABOURING classes, necessity for the better housing of the 363

Ladies, conference of, on domestic hygiene, at the Leeds Congress, 1897, address by Mrs. Fawkes to the . 357

„ conference of, on domestic hygiene, at the Congress at Newcastle-on-Tyne ... 50

„ as sanitary inspectors ... 196

„ aspects of cycling for, by E. B. Turner ... 50

Land treatment and the artificial filter ... 589

„ „ of sewage ... 577, 579

Larkins, W. G., on papers on sewage disposal ... 584

Latham, Baldwin, on Indian sanitation ... 93

Lavatories and baths on ocean steamers and war ships ... 46, 47

Law, the, relating to our meat and milk supply, by G. T. Billing ... 39

PAGE

Law, the, in respect to pollution of rivers ... 319

Lead, methods taken to prevent the action of moorland water on ... 630

„ the action of moorland water on, and the prevention of the same, by C. H. Tattersall ... 625

Lecture to the Congress at Leeds, 1897, by H. Percy Boulnois ... 358

„ to sanitary officers by A. Wynter Blyth ... 189

Leeds, average death-rate in, from 1865 to 1896 ... 332

„ Congress, 1897, popular lecture to the, by Philip Boobbyer ... 389

„ Congress at, in 1897, programme of the ... 232

„ description of houses for the working classes proposed to be erected in 468, 470

„ Exhibition at, 1897 ... 366

„ Exhibition, 1897, list of awards ... 369

„ inaugural address by Robert Farquharson to the Congress at ... 257

„ 1897, lecture to the Congress at, by H. Percy Boulnois ... 358

„ the operation of the Housing of the Working Classes Act in, by George F. Carter ... 465

„ sanitary progress of, during Her Majesty's reign ... 328

„ a decade of sunshine observations at, by H. Crowther and R. Reynolds ... 601

„ tables A, B, C, D, showing the hours of bright sunshine registered from 1887 to 1896, in ... 602, 603, 604, 606

Legislation and law cases, notes on ... 153, 386

Leicester, provision for dealing with storm water ... 576

Library, contributions and additions to, in 1897 148, 250, 383, 664

Lichfield, results of experiments on effluent from coal filter 556, 559

Liquefaction of solid matters 579, 580

Literature of sewage purification 531

Little, Dr. J. Fletcher, on Dr. Kenwood's paper ... 186

PAGE

Liverpool, disposal of house refuse at 360
Local Government Act, effect on County Councils, in carrying out Rivers Pollution Act 554
Local Government Board, requirements with respect to land filtration 552
Lupton, Arnold, on disposal of refuse in a mining village 515
Lynde, F. C., on improved methods of drainage construction 30

MACKENZIE, Dr. Leslie, on the papers by Prof. Delepine, Dr. J. S. Cameron, Dr. Kenwood, and Mr. Wolf Defries 425
„ on Prof. Trevelyan's paper 432
MacLeod, Dr. K., on Mr. Latham's paper 104
Maidstone, outbreak of enteric fever at, caused by polluted water 316
Mair, Dr. L. W. Darra, on Dr. Kenwood's paper 180
Manganese compounds, value of, as agents for sewage purification 539
Manson, Councillor, on our houses 54
Manurial value of sludge 540
Map, importance of the revision of the geological survey 310
Marsden, R. Sidney, on some duties which will devolve upon municipalities in connection with the public and the submerged tenth 16
„ on some sanitary aspects of advertisement 434
Mason, C., on E. T. Hall's paper... 510
Massachusetts State Board of Health reports giving manner of working, breathing, or oxidising filters 551
„ „ action of bacteria of filters 544
Mather, Mrs., on some points of consideration in the hygiene of children 53
Mayell, Mr. A., on Dr. Waldo's paper 91
McNeill, Roger, on isolation hospitals for rural districts 7
Measles during years 1891-1896, cost of the notification of 181

PAGE

Measles, means recommended by Dr. Thomson for obtaining the control of 162
„ the notification of, by Henry Kenwood 161
Meat and milk supply, the law relating to our, by G. T. Billing 39
Median valley region in Yorkshire, description of the rocks of the 595
Medical Officers of Health, conference of, at the Leeds congress, 1897, address by E. C. Seaton to the 335
„ „ conference of, at the Congress at Newcastle-on-Tyne, 1896 1
Medical Officers, the difficulties and duties of, under the notification of Infectious Diseases Act, by William Berry 21
„ „ whole-time service versus part-time service of by F. J. Waldo 19
Meetings held in 1897 134, 202, 375, 640
Members and Associates in 1897 142, 246, 380, 650
Micro-organisms that liquefy solid organic matter 542
„ „ that deal with organic matter in solution 542
„ „ action on chemical compounds containing oxygen 538
Milk a cause of diarrhœa, and a transmitter of infectious disease 4
„ and meat supply, our, and the law relating thereto, by G. T. Billing 39
„ shops and dairies order, necessity for the enforcement of the 3
„ supplies, the control of, by sanitary authorities, by T. Coke Squance 1
„ supply, regulations proposed for the control of the 5
„ tuberculosis after typhoid fever, caused by drinking infected 5

PAGE

Mining village, disposal of refuse in a, by Arnold Lupton 515

Moncrieff, Major G. H. Scott, on E. T. Hall's paper 508

Moorland water, its action on lead, and the prevention of the same, by C. H. Tattersall 625

„ „ on lead, methods taken to prevent the action of 630

Munce, J., on Mr. Carter's paper 472, 476

Municipalities and the duties which will devolve upon them in connection with the public and the submerged tenth, by R. Sidney Marsden 16

Municipal engineering, some sanitary advances in 358

„ representatives, conference of, address by Councillor B. Womersly to the 327

Museum, exhibits added to the 147, 249, 663

NEWCASTLE-ON-TYNE, 1896, Congress at 1

„ resolutions passed at the Congress at 57

Newman, R. W., on temporary dwellings for public works... 514

Newsholme, Dr. A., on Dr. Kenwood's paper 178

„ on Prof. Trevelyan's paper 432

Nield, Herbert, on E. T. Hall's paper 510

Nitrate of soda and purification of sewage by action of micro-organisms 538

Nitrates in sewage 547

Nitrification of sewage 544

„ or oxidation of sewage 546

„ or nitrogen oxidation, second stage of fermentation 537

„ second stage of 551

Nitrifying organisms require large amount of air............... 548

Norrington, J. P., on Dr. Rideal's paper 80

Notes on books and papers in transactions 111, 201, 373, 638

„ on the examination of disinfectants, by Wolf Defries 416

„ general 158, 255, 388, 671

„ on legislation and law cases 153, 386, 670

PAGE

Notification of Infectious Diseases Act, the difficulties and duties of the medical officer of health under the by William Berry 21

„ of measles from 1891-1896, cost of the............ 181

„ „ by Henry Kenwood.. 161

OBITUARY 146, 653, 661

Ocean steamers and warships, baths and lavatories on........................46, 47

„ „ closets and latrines on. 45

„ „ sanitary water services on.......................... 43

„ „ structural sanitary arrangements of, by E. W. de Ruset 42

„ „ ventilation in 48

Oldham Waterworks, Table I. showing analysis of water from the 627

„ „ Table II. showing acidity of water from the 628

Oliver, Thomas, are coal miners exempt from cancer? 20

Ollivant, Sir Charles, on Mr. Latham's paper..................... 107

Organic ammonia in effluent ... 547

„ „ in sewage ... 547

„ „ index to organic matter in sewage 547

Oxidation of sewage 544

„ or nitrification of sewage ... 546

Oxygen, atmospheric, importance of, to fermentative in sewage purification 536

PARKER, J. E., on sewerage and sewage, disposal of, colliery villages 29

„ on A. Lupton's paper 518

Parkes, Dr., table shewing the estimate of the water supply required per head in towns, by 393

Parry, J. W., on Mr. Latham's paper 103

Parry, W. Kaye, on papers on sewage disposal 587

„ on the true principles of sewage purification ... 531

„ on papers on sewage disposal 586

Parsons, Hon. R. C., on Mr. Latham's paper..................... 107

PAGE

Pasteur Institute, an account of an outbreak of rabies in the county borough of Croydon, in the autumn of 1895, and an outline of the anti-rabic treatment by inoculation at the, by Leonard Wilde 12
„ „ description of the anti-rabic treatment at the 13
„ „ tables shewing results of the anti-rabic vaccinations at the, from 1886 to 1895 (inclusive) 16
Pattin, Dr. H. Cooper, on E. T. Hall's paper 509
Peck, Herbert, on the papers by Dr. Wilson and Dr. Thresh 620
Pennine region in Yorkshire, description of the rocks of the 592
Pickering, R., on the papers by Dr. Wilson and Dr. Thresh...... 622
Pollution of rivers, address by Major Lamorock Flower to the conference on 317
„ „ the law in respect to the 319
„ of Air in towns, by J. B. Cohen 607
„ of water supply, danger arising from intermittent 618
Poore, Dr. G. V., on Dr. Rideal's paper........................... 79
„ on treatment of domestic slop-water in isolated houses 519
Popular lecture to the Leeds Congress, 1897, by Philip Boobbyer 389
Population in large towns in India, density of the 97
Porter, Dr. Charles, on the control and supervision of public water supplies by sanitary authorities 10
„ on the papers by Prof. Delepine, Dr. Cameron, Dr. Kenwood, and Mr. Wolf Defries 426
Port sanitary administration, by A. Willesly Harris ... 49
„ „ authorities, conference of, at the Congress at Newcastle-on-Tyne, 1896........................ 40
„ „ law suggested amendments of, by R. S. Holmes 49

PAGE

Port sanitary administration, regulations and preventive measures by Thomas Clarke 49
Precipitation of sewage 548
„ and filtration through specially prepared filters, method of working 553
„ principles involved in 553
Preventive medicine and sanitary science 277, 397
Programme of the Congress at Leeds, 1897 232
Public works, temporary dwellings for, by R. W. Newman ... 514
Purification of sewage by bacteria, by Samuel Rideal 59
„ two stages in 548
„ of rivers and nitrification ... 537
„ of sewage, by Dr. Sidney Barwise 545

RABIES, an account of an outbreak of, in the County borough of Croydon, in the autumn of 1895, and an outline of the anti-rabic treatment by inoculation at the Pasteur Institute, by Leonard Wilde 12
Raeburn, Miss Ruth, on Swedish gymnastics in England 52
Rainfall in India as influencing sanitary work 94
Refuse of houses, disposal at Liverpool of the............ 360
„ in a mining village, disposal of, by Arnold Lupton 515
Reid, Dr. G., on Dr. Rideal's paper 79
Report of the Council of the Sanitary Institute for 1896, annual.................. 115
„ of the royal commission on vaccination, by Francis T. Bond........................ 438
Resolutions passed at the Congress at Newcastle-on-Tyne, 1896.. 57
Re-vaccination an essential element of a national system...... 446
Reviews of books 110, 200, 635
Reynolds, R., on a decade of sunshine observations at Leeds........................... 601
„ on P. F. Kendall's paper ... 600
Richardson, Mr.. on P. F. Kendall's paper 599
„ on J. B. Cohen's paper 609
„ on C. H. Tattersall's paper . 632

PAGE
Rideal, Dr. S., on the papers by Prof. Delepine, Dr. J. S. Cameron, Dr. H. R. Kenwood, and Mr. Wolf Defries 423
„ on purification of sewage by bacteria 59
„ on papers on sewage disposal 579
Ridings, H. Sadleir, on E. T. Hall's paper 512
River pollution, Conference on, address by Major Lamorock Flower ... 317
„ „ the law in respect to... 319
„ water in China, purity of ... 323
Road making, advances made in 362
Rocks of Yorkshire, as a source of water supply, by Percy F. Kendall 591
„ of the Pennine, Median, and Eastern hill regions in Yorkshire, description of the..................592, 595, 597
Rocliffe, Miss G., on hygiene in relation to the physical development of women 50
Roechling, H. A., on Dr. Rideal's paper 77
„ on Dr. Poore's paper 530
„ on papers on sewage disposal 577
Rogers, A., on B. Latham's paper 107
Rooms, the disinfection of, by formic aldehyde vapours, by Henry Kenwood 406
Rounthwaite, R. S., on the jointing of sewer and drain pipes 22
Roussey, Miss de Sumichrast, on the disposal of household refuse, and the improper use of ashpits 54
Rowley, Walter, on J. B. Cohen's paper 609
Royal commission on vaccination, report of the, by Francis T. Bond 438
Rural districts, isolation hospitals for, by Roger McNeill 7
„ „ sanitary work in, by William Bland 31
„ „ water supplies for, and the means of protecting them from contamination, by 'Dr. John C. Thresh 613
Rural districts, cost of a pure water supply in.........614, 615
„ hospitals, disinfection, apparatus for 9

PAGE
Rusett, E. W. de, on structural sanitary arrangements of ocean steamers and war ships......... 42

SALFORD sewage purification works, details of and provision for storm water 574
Sanitary Acts passed within the last fifty years 285
„ aspects of advertisement, by R. Sydney Marsden ... 434
„ authorities, conference of port, at the Congress at Newcastle-on-Tyne, 1896 40
„ „ the control of milk supplies by, by T. Coke Squance 1
„ „ in relation to factories, workshops and shops, the duties of, by T. Foley Cass............... 33
„ compulsion, necessity of ... 341
„ Inspectors, conference of, at the Leeds Congress, 1897, address by Peter Fyfe, to the 347
„ „ conference of, at the congress at Newcastle-on-Tyne, 1896 31
„ „ the education, status, and emoluments of, by A. Wynter Blyth... 189
„ „ ladies as 196
„ „ necessity for the union of.......................... 355
„ Institute, address to the Queen from the......... 216
„ „ annual report of the Council for 1896 115
„ „ commemorative dinner to celebrate the twenty-first anniversary of the foundation of the 218
Sanitary law, suggested amendments of port, by R. S. Holmes 49
„ officers, lectures and demonstrations to 189
„ „ necessity for efficient executive 297
„ organization, importance of 337
„ progress of Leeds during Her Majesty's reign... 328
„ „ valuable features of ... 301
„ science and admistration... 343

PAGE
Sanitary science and preventive medicine ... 277, 397
„ „ public health, etc., table showing diplomas granted in 1893, 1894 and 1895, in ... 344
„ structural arrangements of ocean steamers and war ships, by E. W. de Rusett 42
„ supervision of shelters for the homeless, by F. J. Waldo ... 83
„ water services on ocean steamers and war ships . 43
„ work in India, influence of the rainfall on ... 94
„ „ in rural districts, by William Bland ... 31
Sanitation on board ship, by W. Collingridge ... 40
„ in England, enormous advance during the Victorian era of ... 336
„ of houses, the cardinal conditions of the ... 289
„ Indian, by Baldwin Latham 93
Scarlet fever, the spread of, by Tom Stake ... 32
School hygiene, by Arthur Kent. 488
Schools of the upper middle classes, the teaching and practice of hygiene in, by Mrs. White Wallis ... 55
Scientific basis of sewage treatment, by W. J. Dibdin and George Thudichum ... 541
Scum, floating matter undergoing decomposition in septic tank ... 564
Scott-Moncrieff, on Dr. Rideal's paper ... 78
Seaton, Dr. E. C., address to the conference of medical officers of health, at the Leeds congress, 1897, by. 345
„ on Dr. Bond's paper ... 461
Septic tank filtration at Exeter, tables I. to IV. shewing 64
„ „ system for dealing with sewage ... 63
„ „ table showing filtered samples of sewage in the ... 67
Septic tank, system of sewage disposal, a year's experience of, at Exeter, by Donald Cameron ... 562
„ works at Belle Isle, Exeter 562

PAGE
Septic tanks, details of ... 563
„ filters, details of ... 563
„ construction of ... 564
„ filters, action of ... 567
„ filters, system of working... 563
„ filtering material employed, size of ... 567
„ process, smell from ... 587
„ quantity of sewage dealt with ... 564
„ floating matter, undergoing decomposition in ... 564
„ composition of deposit in... 565
„ results of examination for suspended matters in sewage, by W. J. Dibdin and G. Thudichum, compared with deposit in tanks ... 565
„ ways in which suspended matter, which disappears in the tanks, is disposed of 566
„ gases formed in, disposal and diffusion of ... 566
„ effluents, result of examination of ... 568
„ system at Yeovil, details of and results of working 569
„ „ and manufacturing sewage ... 569, 585
Serum treatment for hydrophobia, description of ... 15
Sewage disposal and sewerage of colliery villages, by J. E. Parker ... 29
„ farm in Surrey, analysis of samples of soil from a ... 70
„ purification by bacteria, by Samuel Rideal ... 59
„ table showing filtered samples of, in the septic tank 67
„ table showing results of filter experiments, dealing with ... 71
„ definition of ... 545
„ analysis of ... 546
„ average gallon will contain 546
„ composition of, and process and products of decomposition ... 541
„ total solid matter in ... 547
„ division of polluting matters in solution ... 535
„ clarification, or first stage .. 550
Sewage, bacteriological treatment of ... 531
„ bacterial filtration ... 548
„ free ammonia in ... 547

PAGE
Sewage, organic ammonia in...... 547
„ „ reliable index to amount of organic or polluting matter in........... 547
„ domestic, chlorine in, index to strength 547
„ nitrates in 547
„ oxidation or nitrification of 546
„ effect of solid matters separated first and sewage purified by two processes, exemplified by analysis given 549
„ precipitation of 548
„ attempts to disinfect deprecated 548
„ filters, materials for construction of........... 551
„ „ size of material for filtering medium ... 552
„ „ amount of work they will do 552
„ „ (bacteria beds). regulation of quantity and times for charges with sewage 544
„ disposal, a year's experience of the septic tank system at Exeter, by Donald Cameron 562
„ purification, the true principles of, by W. Kaye Parry 531
„ the purification of, by Dr. Sidney Barwise 545
„ object to be attained in purification 546
„ purification, methods of ... 542
„ „ by natural agencies... 541
„ „ by land treatment and by precipitation...... 555
„ „ amount of land necessary for, according to process adopted... 552
„ „ two stages in 548
„ „ sterilizing or antiseptic agents must be excluded 542
„ „ stormwater in relation to, by E. J. Silcock . 570
„ „ literature of 531
„ treatment, scientific basis of, by W. J. Dibdin and George Thudichum .. 541
„ „ suggestion for systematic experiments... 585
Sewage, tables showing the average composition of 519, 520
Sewer and drain pipes, jointing of, by R. S. Rounthwaite 22

PAGE
Sewerage in India, defects of ... 98
„ and sewage disposal of colliery villages, by J. E. Parker 29
Sewers, introduction of trade wastes, containing chemical agents and mineral acids deprecated 548
Shegog, T. A., on papers on sewage disposal 583
Shelters for the homeless, dangers of insanitary 87
„ for the homeless, the sanitary supervision of, by F. J. Waldo, M.A., M.D. 83
Ships, sanitary inspection of, by Alderman Evan Fraser ... 49
„ sanitation on board, by Dr. W. Collingridge 40
Sick nursing and hygiene, the value of teaching them to working women, by Miss J. S. Davis 52
Silcock, E. J., on storm water in relation to sewage purification 570
Slator, J. W., on soluble salts of manganese.......................... 539
Slop-drainage, principles of 523
Slop-filter for kitchen sink, figure V., illustrating 528
Slop-water, composition of domestic 522
Sludge, action of liquefying bacteria on 548
„ difficulty 582
„ disposal, and aërobic and anaërobic systems 543
„ manganese compounds make inodorous 540
„ manurial value of 540
Smith, Dr. Walter, on Mr. Carter's paper 481
Smith, E. Shrapnel, on papers on sewage disposal 584
Solid matter in sewage 547
Spence's alumino-ferric blocks ... 550
Squance, T. Coke, on the control of milk supplies, by sanitary authorities 1
Stake, Tom, on the spread of scarlet fever 32
Standards for sewage effluent ... 580
„ of purity for effluents, Derbyshire County Council 547
Statement of income and expenditure for 1896 130
Stockport main drainage, provision for storm water 575

PAGE
Stormwater in relation to sewage purification, by E. J. Silcock 570
„ „ provision for at Salford, Stockport and Leicester 574, 576
„ „ difficulties of purification owing to fluction of flow 571
„ „ dry weather flow of sewage compared ... 571
„ „ requirements for dealing with 571
„ „ and separate systems of sewerage............ 572
„ „ devices for dealing with 573
Stott, Dr. H., on Prof. Trevelyan's paper 431
Submerged tenth, methods for dealing with the............ 18
„ „ some duties which will devolve upon municipalities in connection with the public, and the, by R. Sydney Marsden 16
Sulphur as a disinfectant 399
Sunshine observations at Leeds, a decade of, by H. Crowther and R. Reynolds...... 601
„ registered in Leeds, from 1887 to 1896, tables A, B, C, D, showing the hours bright 602, 603, 604, 606
Supplies, the control and supervision by sanitary authorities of the public water, by Charles Porter 10
Sutton, system of (bacterial) sewage treatment at 543
Swedish Gymnastics in England, by Miss Ruth Raeburn 52
Sykes, Dr. J. F. J., on Dr. Bond's paper 459

TABLE I. showing analysis of water from the Oldham Waterworks.................. 627
„ II. showing acidity of water from the Oldham Waterworks 628
Table showing amount of carbonic acid in an empty filter 73
„ showing analysis of samples of soil from a sewage farm in Surrey 70
PAGE
Table showing average death-rate in Leeds, from 1865 to 1896 332
„ showing the chief chemical constituents and varieties of foods 390
„ showing death-rate in Bombay for the years 1891 to 1895 (inclusive) 102
„ showing death-rates from hydrophobia among persons bitten by alleged rabid animals, French Board of Health, 1862 to 1872 15
„ showing details of experiments in disinfecting with aldehyde vapours 421
„ showing diplomas in sanitary science, public health &c., granted in 1893, 1894, and 1895 344
„ showing Dr. Parkes estimate of the water supply per head required in towns 393
„ showing for England and Wales the annual rates of mortality per 1000 persons, from 1851 to 1895, from the seven chief zymotic diseases............ 161
„ showing filtered samples of sewage in the septic tank 67
„ showing results of filter experiments dealing with sewage 71
„ showing amount of carbonic acid formed in tank, and amount of carbonic acid gas in the air of the septic tank 66
„ showing the percentages of purification due to filters, and to septic tank 74
„ showing results of the antirabic vaccinations at the Pasteur Institute from 1886 to 1895 (inclusive)... 16
„ showing results of experiments with various disinfectants........ 417
„ I. to IV. showing septic tank filtration at Exeter......... 64
Tables showing average composition of sewage ... 519, 520
„ A, B, C, D showing the hours of bright sunshine gistered at Leeds, from 1887 to 1896 602, 603, 604, 606

PAGE

Tattersall, C. H., on the action of moorland water on lead, and the prevention of the same ... 625
Taylor, H. W., on A. Lupton's paper ... 517
Teale, T. Pridgin, address to Section I. by ... 277
  „ on Dr. Kaye's paper ... 487
  „ on Prof. Trevelyan's paper.. 433
Thompson, J. G., on Dr. Waldo's paper ... 90
Thomson, Dr., means recommended for obtaining control of measles by... 162
Thresh, John C., on water supplies for rural districts, and the means of protecting them from contamination ... 613
Thudichum, G., and W. J. Dibdin, on scientific basis of sewage treatment ... 541
Towns, air pollution in, by J. B. Cohen ... 607
Trevelyan, Prof. E. F., on the behaviour of the diphtheria bacillus outside the human body ... 430
  „ on A. Kent's paper... 490
  „ „ on papers on sewage disposal ... 581
True principles of sewage purification, by W. Kaye Parry ... 531
Tuberculosis after typhoid fever caused by infected milk... 5
Turner, E. B., on the aspects of cycling for ladies ... 50

UDALE, Councillor Stanley, on E. T. Hall's paper ... 508
Union of sanitary inspectors, necessity for the ... 355

VACCINATION, report of the royal commission on, by Francis T. Bond, M.D... 438
Vacher, Dr. F., on Dr. Bonds paper ... 453
  „ on Dr. Kenwood's paper ... 183
  „ on A. Kent's paper... 490
  „ on Dr. Marsden's paper ... 437
Ventilation in factories and workshops, necessity for better ... 352
  „ of houses and factories, etc., importance of the proper 394
  „ in ocean steamers and war ships ... 48

PAGE

Voelcker, Dr. on Mr. Latham's paper ... 105

WALDO, F. J., on the sanitary supervision of shelters for the homeless ... 83
  „ on whole-time service of medical officers of health, versus part-time service... 19
Wallis, Mrs. White, on the teaching and practice of hygiene in schools of the upper middle classes... 55
Ward accessories in fever hospitals ... 501
Water-analyses, common defects in ... 307
Waters, Dr. Clough, on Dr. Bond's paper... 460
Water, moorland, methods taken to prevent the action of, on lead ... 630
  „ services, sanitary, on ocean steamers and war ships... 43
  „ supplies, Acts dealing with public... 10, 11
  „ „ for rural districts, and the means of protecting them from contamination, by Dr. John C. Thresh... 613
  „ „ from wells, by Dr. J. Mitchell Wilson ... 611
  „ „ public, the control and supervision of, by sanitary authorities by Dr. Charles Porter ... 10
Water supply at Eastbourne ... 314
  „ „ danger arising from intermittent, pollution of ... 618
  „ „ in India, necessity for pure ... 100
  „ „ in large towns, the necessity for a pure... 293
  „ „ in rural districts, cost of a pure ...614, 615
  „ „ means for the prevention of contamination of... 616
  „ „ required per head in towns, table showing Dr. Parke's estimate of the ... 393
  „ „ the rocks of Yorkshire as a source of, by Percy F. Kendall ... 591
Waste-pipes, figures I. and II., illustrating ... 524

PAGE

Waterworks, the question of a protected area round 308
Wells, Sir Spencer, Obituary...... 146
Wells, water supplies from, by J. Mitchell Wilson 611
Whitaker, W., B.A., address to Section III., by 304
„ on P. F. Kendall's paper ... 599
„ on the paper by H. Crowther and R. Reynolds ... 607
„ on J. B Cohen's paper 610
„ on the papers by Dr. Wilson and Dr. Thresh 612, 619
„ on C. H. Tattersall's paper . 632
Whole-time service of medical officers of health versus part-time service, by F. J. Waldo 19
Wilde, Leonard, on an account of an outbreak of rabies in the County borough of Croydon in the autumn of 1895, and an outline of the anti-rabic treatment by inoculation at the Pasteur Institute................. 12
Willcox, J. E., on A. Lupton's paper 517
Williams, Dr. on Prof. Trevelyan's paper 432
Willis, Mr. E., on Dr. Waldo's paper 90
Wilson, Dr. J. Mitchell, on E. T. Hall's paper................. 511
„ on water supplies from wells..... 611
Wolverhampton, results of experiments on effluent from coal filter 560-2

PAG

Women, hygiene in relation to the physical development of, by Miss G. Rocliffe..... 5
Womersley, Councillor B., address to the Conference of municipal representatives by 32
„ „ on Mr. Carter's paper 47
Woodcock, Dr. on Dr. Bond's paper 45
Woodhead, Dr. Sims, on the papers by Prof. Delepine, Dr. J. S. Cameron, Dr. H. R. Kenwood, and Mr. Wolf Defries ... 41
Working classes, the importance of the proper housing of the 291
„ „ in Leeds, description of proposed houses for the 468, 47
YEOVIL, details of, and results of septic tank system at......... 56
Yorkshire, the rocks of, as a source of water supply, by Percy F. Kendall 591
„ description of the rocks of the Pennine region 59
„ description of the rocks of the Median valley in...... 59
„ description of the rocks of the Eastern hill valley in 597

ZYMOTIC diseases, table showing annual rates of mortality per 1,000 persons in England and Wales from 1851 to 1895, from the seven chief 161

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